INDEX

MACARTNEY
UNDERWATER TECHNOLOGY
FILE NO.: S1110114
CUSTOMER: WHOI
SERIAL NUMBER: 11151-35479
MANUFACTORER: MacArtney A/S

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1. Section - Introduction

1.1 Limited Liability Statement

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MacArtney A/S
Gl. Guldagervej 48
DK-6710 Esbjerg
Denmark

☎ - (+45) 76 13 20 00
☎ – (+45) 75 11 72 20
✉ - mac-dk@macartney.com
💻 - http://www.macartney.com

1.2 Introduction

1.2.1 Introduction

The purpose of this manual is to present information that is needed to operate and service the winch system. The manual will cover all main aspects of handling, installation, operation and maintenance. In case of malfunction or failure, section 8 contains some help for trouble shooting so that the defect component can be repaired or replaced with a spare part.

This manual is intended for use on board the vessel carrying the winch system, and at the base during mobilisation, demobilisation and operation.

1.2.2 Important Notices

Working safely:
The winch is dangerous and powerful equipment, which has to be used only by skilled personnel with the required training.

- Make sure that the winch is proper installed before use; consult the mobilisation chapter of the user manual.
- Always keep maintenance of the winch in a good state as described in the manual.
- Keep away from all rotating objects.
- Never try to replace electronics or electric components while the power is on.
- The main switch must be turned off and secured with a lock before any repairs are performed.
- Use the winch in the softest operation possible, this prolongs lifetime for the components and increases safety.
- Use the recommended spares, no guarantee is granted if others are used.
- All repairs must be performed by skilled craftsmen.
- Keep the winch in good condition and be aware of any noises that might indicate that a malfunction is under development.
- The winch can be stopped any time by activating the emergency stop.
- Check lubrication of all moving parts, gears, bearings and chain according to maintenance procedure.
- The system uses 400 to 440VAC as power source - Treat this voltage level with respect.
- Electronic circuit and components are contained in the Control panels, Electrical Panel, junction boxes etc. Handle electronics components with care and be aware that some components may be electro static sensitive.

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2 Section - System Description

2.1 Introduction

The winch is an electric driven winch.

The drum is equipped with a large tooth rim, driven by a electric drive working onto the drum toothed rim. The drive unit consists of an electric asynchronous motor with a gearbox, the drive unit is driven by a frequency converter with feedback from an incremental encoder. Each motor has an electric inbuilt disc brake also controlled by the frequency converter.

There is a thermistor for protection of the windings built in the motor, which trip the motor if winding temperature exceeds 140°C.

When the winch pay-out umbilical, the motor acts as generator and produce electric power. The power generated by the winch is burned off in a “Brake resistor bank”. The max. amount of power to be burned off is 700VDC 15 KW.

During lowering of a load or deceleration of the speed the frequency converters will put out current to the brake resistors, hereby burning of the energy.

The winch has basically 2 different working modes – all functionality is based on these 2 modes.

1) **Speed-mode:**
In Speed-mode the frequency converters are controlled by a speed input signal, from either a joystick or from a MRU (Motion Reference Unit) for the Active Heave Compensation (AHC). In joystick mode the winch can be operated from either the local control station or from the remote rack mounted panel. In AHC mode the winch receives a speed signal from the MRU. This mode is used to keep the equipment stationary in the water column during decent or recovering or general use
Note:
AHC-mode is designed for approx. 15 min operation time pr. 30 minutes. If AHC mode period is extended above allowed time scale the winch motors may increase the operating temperature above limits, and give a high temp or High-High trip. The winch will trip if motor winding temp exceed 140ºC.

The efficiency of the AHC system has highest performance on the winch top layer and decrease with increased depth. If the winch is in speed mode and the joystick is in center position, the load will be kept static hanging only on the magnetic field of the motors and the brakes are not engaged. If the equipment is entangled to a subsea structure hereby resulting in an overload of the winch, the winch will automatically pay out the umbilical and give an audio alarm.(Auto rendering)

For more details see section 5.2.2

2) Constant **Tension mode:**
In tension mode the winch is operating on a torque input signal or a load-cell signal and the winch drum speed cannot be adjusted, because when tension mode is selected, it is the tension in the umbilical that has the determining factor. The winch will heave or slack to adjust to the applied load setting shown in the display.

For more details see section 5.2.2

Brake resistor
The brake resistor is basically an industry quality fan heater to get rid of the power generated by the umbilical winch during umbilical pay-out or de-acceleration of the winch.

Warning:
The voltage is 700VDC 20 amp output from the winch to the brake resistor.

Level Wind
To help spooling the umbilical onto the drum the winch is equipped with an electronic controlled level wind. The level wind is driven by an electric asynchronous motor and a frequency converter. An absolute encoder is placed on the winch drum and one on the level wind. The PLC calculates the necessary movement of the level wind with respect to the umbilical diameter and the rotation of the drum. Input regarding the umbilical diameter is done on the operator's panel. We recommend that the diameter input is set to app. 1,02-1,04 x actual diameter of cable. If a correction is made by punching in a new value for the diameter the PLC will calculate trough all the layers and finally correct the position of the trolley.

Never cut back umbilical or adjust on level wind manually without following the instructions in the manual. This can result in a mismatch between umbilical drum and level wind.

2.2 System Description

The winch system comprises of several main components, see Figure 1 – Winch System, which must be present for a system to work.

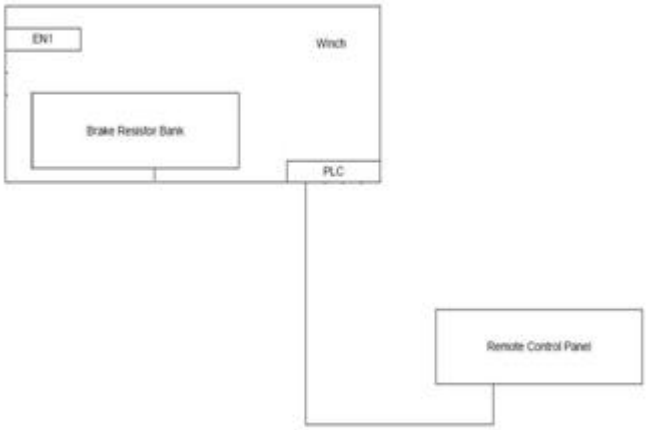


Figure 1 – Winch System

2.2.1 Main winch switchboard

For more details see section 5.2.

Main Switchboard

The winch has 2 off emergency stop buttons. One on the main switchboard door, and one on the remote control. The emergency stop button trip the main incoming breaker in the main switchboard except the control system. Before service or repair inside the main switchboard the main supply cable has to be disconnected.
To be able to operate the winch after a system trip, make sure the actual Emergency stop button is released and then press the reset button (S10) on winch main switchboard door.

On the main switchboard panel door front there are indicators for power on and heating on.

NOTE! When a Emergency Stop is activated; wait for at least 30 seconds before activating [RESET Emergency Stop] on switchboard panel door.

2.2.2 Brake System

The winch has been equipped with 2 individual break systems:

When winch is “powered on” the electrical motor disc brake opens.

If emergency button is activated, the electrical motor disc brakes engage within a fraction of a second.

- Electrical motors disc brake.

When the start/stop button is activated on main switchboard or remote control panel, the electrical motor disc brake will instantly open (controlled by the frequency converter). Doing operation the load is held by the magnetic field in the main electrical drive motor.

2.2.3 AHC System

The winch has been equipped with an AHC system. The AHC system compensate for the vertical movements of the vessel. When the vessel ascents, the winch pay out additional umbilical and when the vessel descents, the winch haul in umbilical. Vertical movements are identified by the use of a MRU (please refer to section 2.2.4). The AHC is only used during launch and recovery of the submerged equipment.

The AHC cannot be activated, until the umbilical pay-out length is more than 30m on the display.

When the AHC button is activated the AHC button will flash during the MRU signal “phase in” sequence. The winch will smoothly enter into AHC mode to avoid a snatch load on the umbilical. When the operator deactivate AHC mode, the AHC button will start flashing during the “phase out” sequence. The phase in/out sequence is approx. 10 seconds.

Note:
The MRU give a “ready signal” to the winch control system, to confirm the MRU signal is accurate. If the MRU stops sending “ready signal” to the winch control system, the winch immediately change over to speed mode without ramping out.

2.2.4 MRU (OPTIONAL)

The winch is equipped with a MRU (OPTIONAL) – Motion Reference Unit, which is able to identify the movements of the launch point and feedback the result to the AHC loop in the winch.

The MRU is specially designed for high precision motion measurements in marine applications and for users requiring high accuracy roll, pitch and heave measurements. The MRU provides high performance motion data for various marine applications ranging from small underwater vehicles to large ship motion control. Very high reliability is achieved by using solid-state sensors with no moving parts and the proven MRU electrical and mechanical construction. The MRU can also give input signal to a pc, for monitoring the wave height at the work site with a program.

2.2.5 Winch

The drum holds the cable by using a Lebus shell (Optional), mounted directly onto the winch drum. If the umbilical type is changed, it is very important to also change the Lebus shell for the new umbilical size.

In the main electric drive motor drive side of the winch, an absolute encoder is mounted in the centre. The encoder communicates directly to the PLC, using the profibus standard protocol. The encoder feedback is used for the following calculations:

- Cable length
- Cable speed
- Number of umbilical layers
- Control of level wind position.

Since the encoder is absolute, it is not necessary to apply power to the winch all the time. The encoder will store the last position and hold it.

2.2.6 Slip ring installation

Connection to the slip ring is done using the termination junction box. Please refer to section 7 for electrical connection through the slip ring.

2.2.7 Brake resistor

The brake resistor is used as a load source to burn off the electric power produced during umbilical pay-out. The brake resistors are not in use during umbilical haul-in.

2.2.8 Drip tray (Optional)

Under the drum, a drip tray is installed to gather all used cooling water and other fluids. These fluids will be lead to a 2” connection, from where the disposal fluid can be prober treated.

Figure 2 – Drip tray outlet

3 Section - Handling / Mobilization

3.1 Pre-Check

3.1.1 Installation Pre-Check

Reason
The winch has to be proper installed before start up and use. This is to insure proper performance and working safely.

Winch Fabrication Quality
Verify winch integrity.

Test procedure.
A visual check, of all items will be carried out, to ensure all parts and subparts are present and all workmanship is acceptably performed.

Test equipment.
No special equipment.

Acceptance criteria.
Parts must be present and in good condition

Check list.

I)	Winch, including slip ring and umbilical (if supplied by MacArtney)	_____
II)	Brake Resistor	_____
III)	Electronic panel	_____
IV)	Local control panel	_____
V)	Remote control panel (Optional)	_____
VI)	MRU (Optional)	_____
VII)	Deck cables (if supplied by MacArtney)	_____

3.1.2 Winch Dimensions Standard setup

Please refer to section 2.1. Hardware identification sheet

3.1.3 Lifting

Reason:
Before transportation or mobilisation of the winch, ensure that top mounted right angle level wind is removed and a 4-leg lifting gear and lifting boom for transport purposes are in place. This is done to ensure that the winch can be lifted in a correct and safe manner.

Procedure:
The winch skid is equipped with 4 lifting pad eyes in each upper corner suitable for a 4 leg lifting gear max gross 3000 kg.

Sling leg angle to vertical is max 45°.

3.1.4 Deck Fastening

Reason:
This is done to ensure that the winch is securely fastened on the deck. It is vital that the deck foundation complies with the foundation calculations.

Procedure:

1) Place the frame on the deck and tighten all bolts according the foundation matrix.
2) Inspect that all moving part can operate freely without any obstructions.
3) Inspect the winch for loose bolts and nut that has to be tightened before operation
4) Control hat no parts are damaged during storage and transport
5) Grease all part as necessary and check oil level (see section 4)

Please see section 3.2 for foundation calculations.

3.1.5 Installation of Main Switchboard.

This is done to ensure that the switchboard will be connected to the winch in a correct manner. The main switchboard can be pre-installed on the front/rear side of the winch frame (optional), or at a location nearby. The maximum allowed cable length between main switchboard and main electric drive motors are at least 50 meter.

3.1.6 Installation of Remote Control panel (Optional).

This is done to ensure that the remote control panel will be connected to the winch in a correct manner.

3.1.7 Electrical Connection

The electrical power requirements are:

Voltage:	440/400 VAC
Frequency:	60 Hz or (50 Hz)
Amp:	Min 3 phase 30 A

Please note, the winch is designed for 400/440 VAC 50/60Hz power supply. If the winch is connected to a 400 VAC, 50 Hz power supply a reduction in speed of 15% will be introduced.

The input power cables, are to be connected to the main switchboard, please refer to section 7 – for electrical documentation. The input cable will be connected to the terminal row X1: L1, L2, L3

For more details see section 7

3.1.8 Grease

On the winch the operator will find several grease points. These will have to be greased according to the maintenance procedure, please refer to section 4.2.4

Start-up Procedure

Procedure:

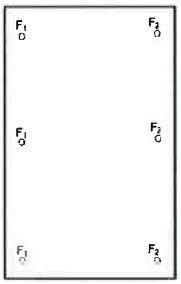
1. Visual inspection of all electrical cables. Perform an insulation test with the cable disconnected if damaged cable is discovered.
2. When power on, check “Power On” indicator on Main switch board.
3. Check and release Emergency stops (Main switch board, and Remote control station).
4. Check that “Reset Emergency Stop” button is not lit. If Emergency Stop is lit, check Emergency stop control circuits drawing.
5. Check that “Remote control station” is online (operator panel shows “No comms” error).
6. Check control selector switch.
    a. Set remote panel in control, check indicator for “In control” light.
    b. Set Main panel “In control”, check indicator for “In control” light.
7. Reset emergency stop by pressing “Reset Emergency Stop” on Main switchboard front panel. This will close the main breaker and power up the frequency converters.
8. Check and acknowledge alarms on main control panel according to alarm list and recommendations in section 8.1
9. By pressing the Start button the following will happened:
    a. The disc brake on the motor will release and the electromagnetic field will hold the load.
10. The frequency converter is started with speed reference signal zero Mode is “Normal” speed mode controlled by joystick.
11. Flashing light on winch indicate the winch is active.
12. The winch is now ready for use.
13. In case of a critical fault the winch will stop (high temperature on winch motors will trip the main breaker), if feedback from electrical brake on winch motors disappears, the winch will stop and issue an alarm.
14. Please note, if the umbilical has been re-terminated, please remember to preset the cable drum.

3.2 Section - Foundation Calculation and reaction forces

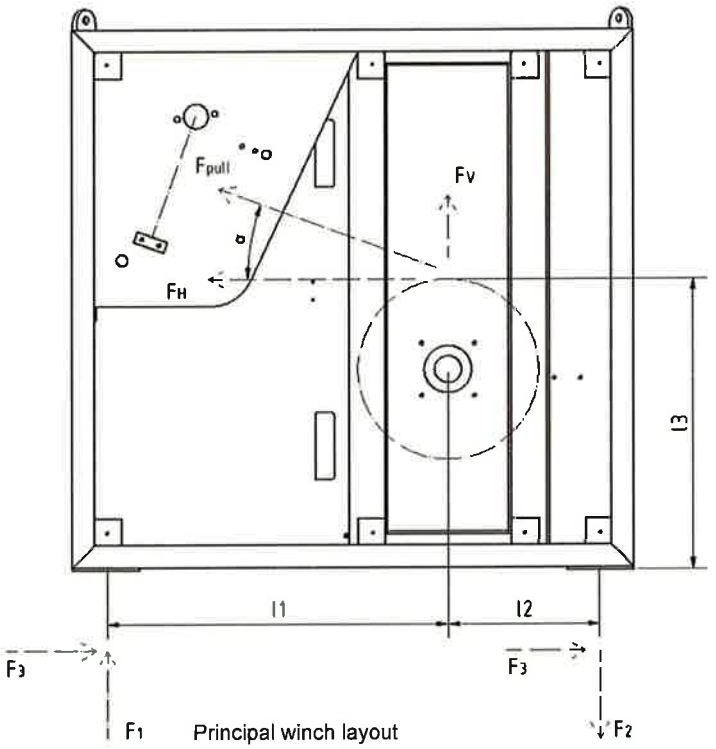
Foundation reaction calculations

Reactions in the foundation structure are calculated here below, based on a worst case scenario where the full load of the umbilical pull is exerted only on the sea fastening brackets on one side of the winch.

Fpull:	Winch SWL	15 kN
m_1:	Max gross winch	3000 kg
m_2:	Winch weight excl. umbilical	2000 kg
α:	Vertical fleet angle	15°
l1	Distance 1	677 mm
l2	Distance 2	543 mm
l3	Distance 3	731 mm



Foundation seen from below



Principal winch layout

Forces

Fv = Fpull·SIN α = 15000·SIN15 = 3.9 kN

Fh = Fpull·COS α = 15000·COS15 = 14.5 kN

Vertical Reactions

$$F1 = \frac{Fh \cdot l3 - Fv \cdot l2}{(l1+l2)} + \frac{m_1 \cdot g}{6} = 16.8 \text{ kN}$$

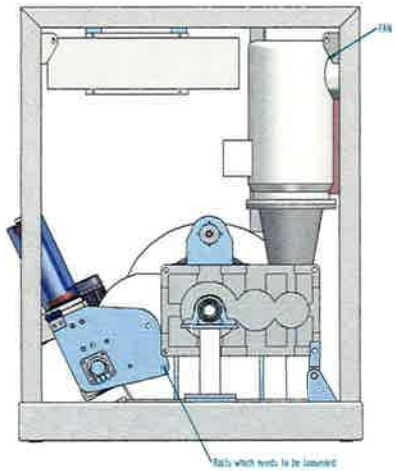
$$F2 = \frac{Fv \cdot l1 + Fh \cdot l3}{(l1+l2)} - \frac{m_2 \cdot g}{6} = 4.2 \text{ kN}$$

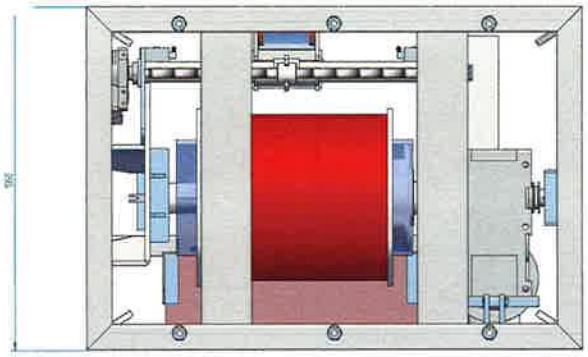
Horizontal Reactions

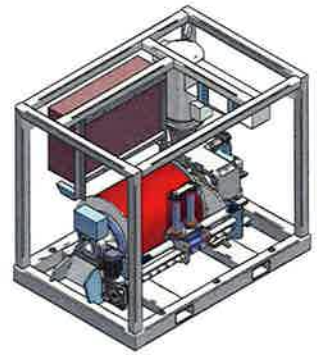
F3 = Fh / 2 = 7.2 kN

Performed by: TBR Date: 15-02-2012 Rev: A
Approved by: LAR

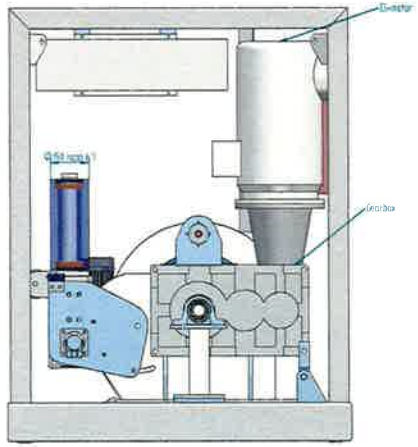
When the Levelwind is in this position then its easier to take out the drum.

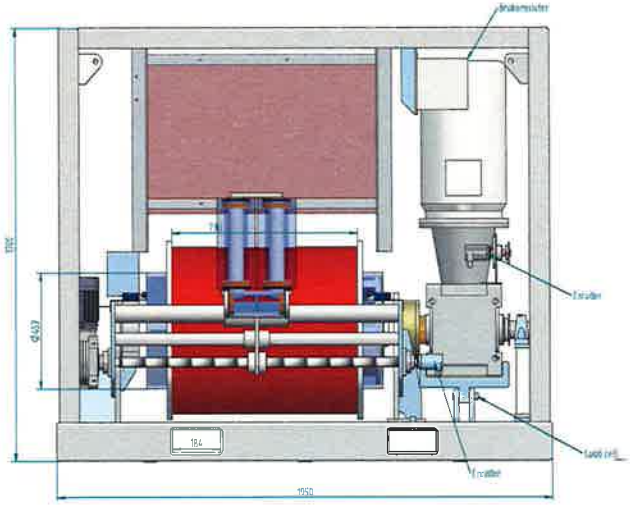


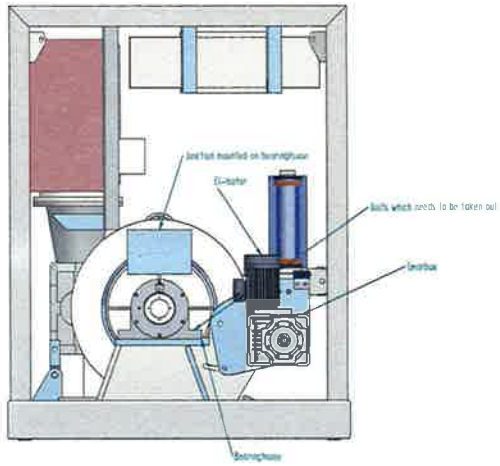


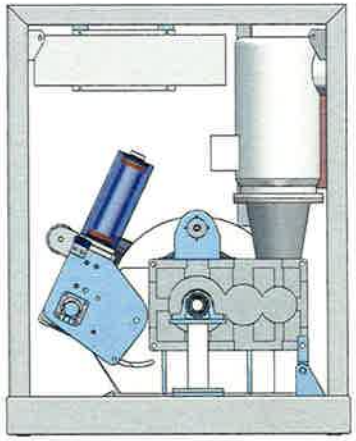


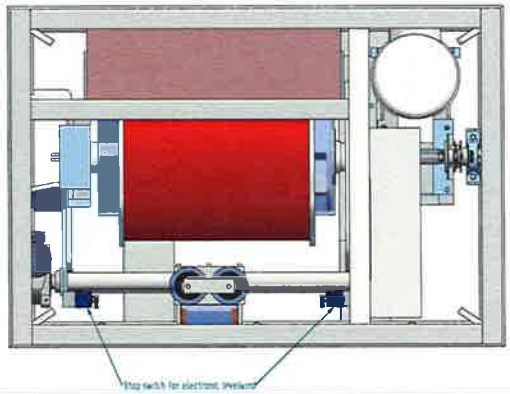
Preliminary sketch











To desassemble the drum the bolts for the bearinghouse needs to be taken out. The bolts in the Levelwind needs to be loosened

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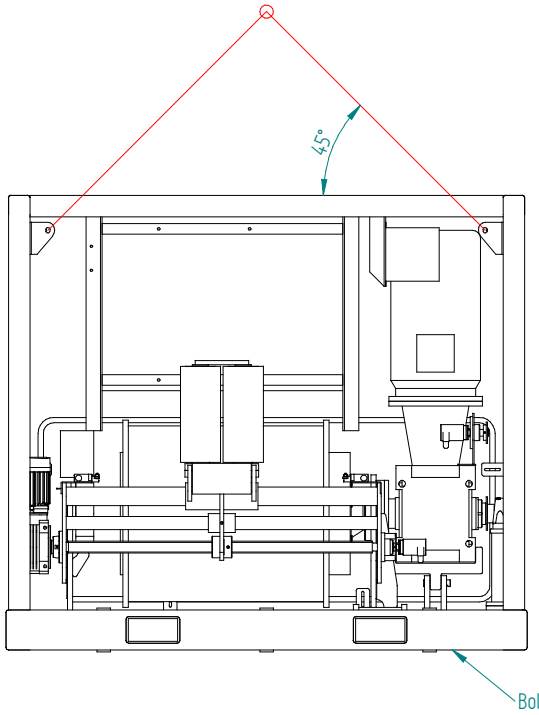
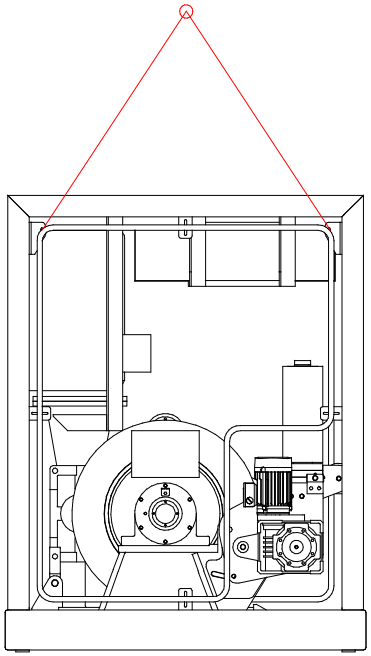
Customer: WHOI	Subject: Winch2000-8,18-10,6
MacArtney UNDERWATER TECHNOLOGY SH GROUP AS Hydraulic · Steel · Engineering	Scale: 1:10 Date: 18-09-10
	Drawn by: TS Order no: 11151-35479
	Format: A1 Drawing no: 35479-0





Max Gross 3000 kg

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4 Section - Maintenance

4.1 Maintenance

Only very little maintenance is needed of the Winch. The mechanical structure itself as well as the electrical components needs supervised according to the maintenance Schedule, listed below. When replacing a component, please make sure, it is identical or compatible.

4.1.1 Daily Maintenance Schedule:

Daily maintenance:

- Check the main winch drive cog wheels not lack of grease (dry) according to manual section 4.2.4.
- Check if the level wind spindle and guide are greased and grease if necessary.
- Visual inspection of major bolt connections.
- Check the winch for unusual noise. If an unusual noise is detected, locate the source and contact MacArtney A/S for further action.
- Check for oil leak
- Check the following items on the frequency converter with system in operation:
    - The motor should not be vibrating or making unusual noises.
    - There should be no abnormal heat generation
    - The ambient temperature should not be too high.

4.1.2 Monthly Maintenance Schedule:

Monthly maintenance:

- All bearings must be greased on a regular basis
- Grease encoder chain drive using a soft brush (heavy duty grease for open gear sets).
    - 1 x Drive on level wind
    - 1 x Drive on drum in drive end

4.1.3 6 Months or every 1000 running hours Maintenance Schedule:

Every 6 Months or 1000 running hour (what ever occurs first) maintenance
(First service after 2 Months or 300 running hours whatever occurs first.)

- Check for leaks in the gearbox - repair if necessary.
- Check main bolt connections on the winch – use a torque-limiting tool according to manual section 4.2.1.
- Greasing as necessary.
- Function test.
- Check and clean fans in electrical cabinet.
- Check and clean resistor elements inside brake resistor for salt build-up and the fan in brake resistor.
- Adjust brake inside main el. motor, see section 4.6.1

4.1.4 Yearly Maintenance Schedule:

Yearly Maintenance:

- Change gear oil
- Check and tighten all bolts and screws in electrical components.
- Frequency converter shall be charges one a year, to charge the capacitor. This I done by putting 3-Phases on the winch and lad it charges for 3 minutes, without running the winch. (Make sure that there is power on the frequency converter when this is done)

4.1.5 Maintenance Schedule:

3-year Maintenance:

- Change fans in electrical switchboard.

5-year Maintenance:

- Battery in PLC and MRU must be replaced.

20000 running hours Maintenance:

- For every 20000 running hour, the bearing in the main motors needs to be changed.

Always be aware of faulty noises that could indicate damage to one or more components.

4.2 Mechanical Maintenance

4.2.1 Required tightening torques on primary bolt connections

Mechanical		
Bolt size	**Connection**	**Torque**
M20 L= 60	Bearing house/A-test + A-test/Frame	366 Nm
M16 L= 45	Shaft	180 Nm
M20 L=100	Gear with nut	366 Nm
M14 L= 35	Level wind @ the guide rolls	117 Nm
M14 L= 35	Gear consol	117 Nm
M10 L= 20	Support for gear	4 2 Nm

4.2.2 Spindle Oil Level

Oil level must be checked on daily basis. This is done by visually securing that oil level reaches the gear centre point when gear is not running.

INSPECTION WINDOW

We recommend **TOTAL**	**CARTER SH100**	- 20ºC….. 5ºC
	CARTER SH150	+ 5ºC……40ºC
	CARTER SH220	+20º……..50ºC

From SH Group A/S gear is filled with Total Carter SH150.

4.2.3 Mechanical manual for winch MASH 2000

Identifications sheet

Type: MASH 2000/8,18-10,6
Winch number: 11151-35479

Winch performance:

Weight Max Gross	3000kg
Height	1707 mm
Length	1950 mm
Depth	1350 mm
SWL	15 kN
Speed bottom layer	39 m/min
Speed top layer	55 m/min

Brake resistors warning:
HOT UNDER OPERATION

<u>For each 6 months or 1000 running hours whatever occurs first:</u>

(First service after 2 Months or 300 running hours whatever occurs first.)

- Check for leaks in the gear - repair if necessary.
- Check main bolt connections on the winch – use a torque-limiting tool.
- Greasing as necessary.
- Function test.

Always be aware of faulty noises that could indicate damage to one or more components.

Oil type:

Gear oil: SH Carter 150

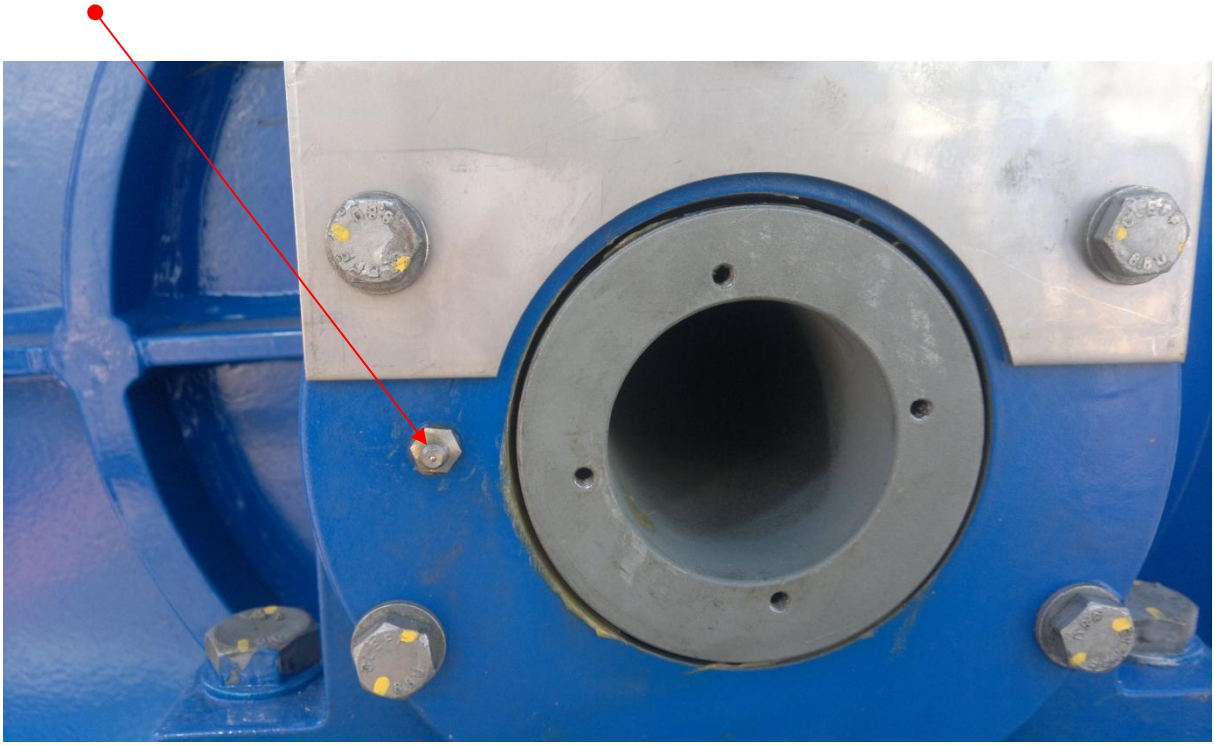
4.2.4 Lubrication points & oil levels MASH 2000

Grease point:

Level wind spindle and guide tube must always be well greased to insure low friction and to prevent rust. To make sure that there is enough grease SHG recommend the use of a brush and then “paint” the grease on the 3 axles.
Use good soft water repellent grease.

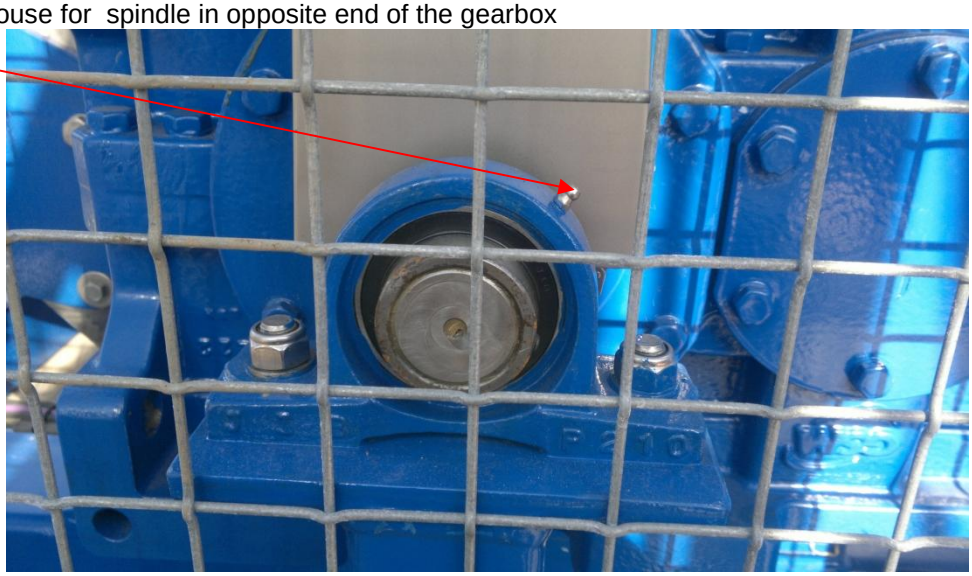
Grease point (continued)

The bearings must be greased on a regular basis at least every month.
Pump grease into the bearing house until grease start to escape at the seal.



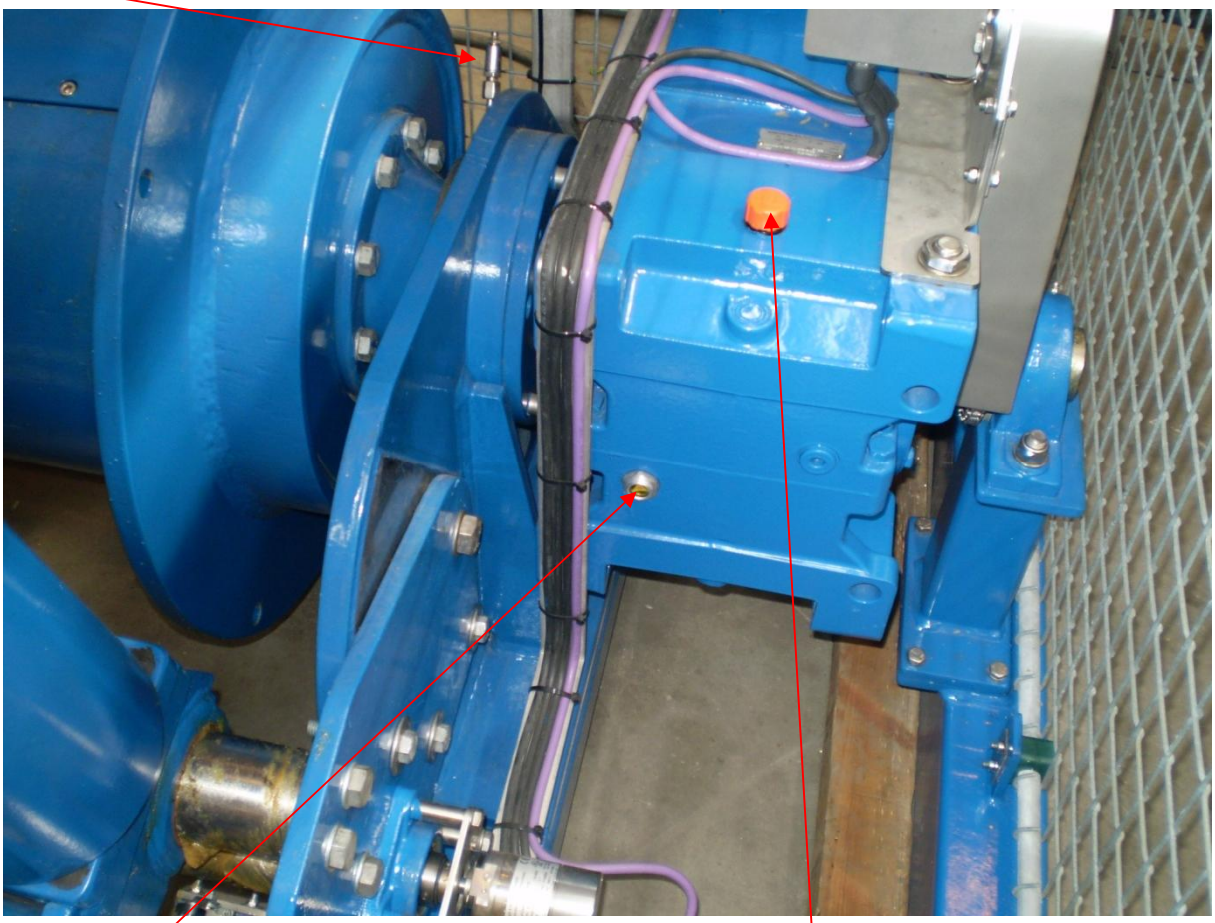
Grease point (continued)

Bearing house for spindle in opposite end of the gearbox



Grease point (continued)

The drum bearing must be greased on a regular basis at least every month.
Pump grease into the bearing house until grease start to escape at the seal.



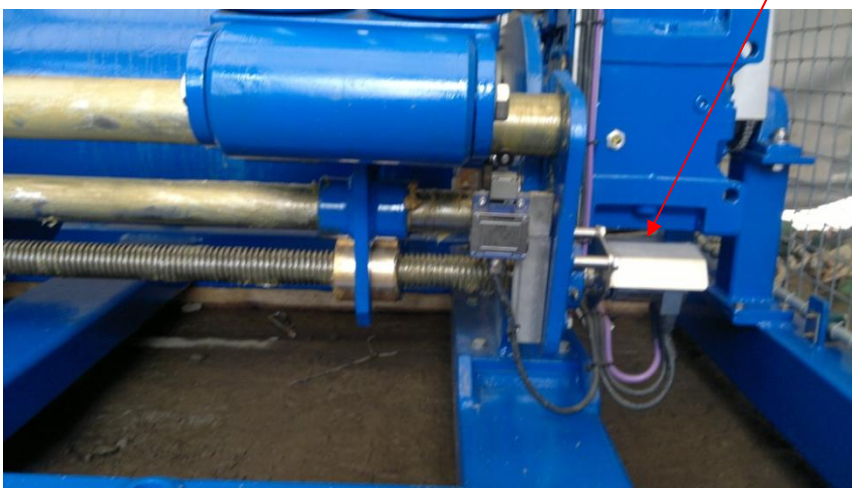
Check oil level in the gearbox.

Oil inlet

Encoders

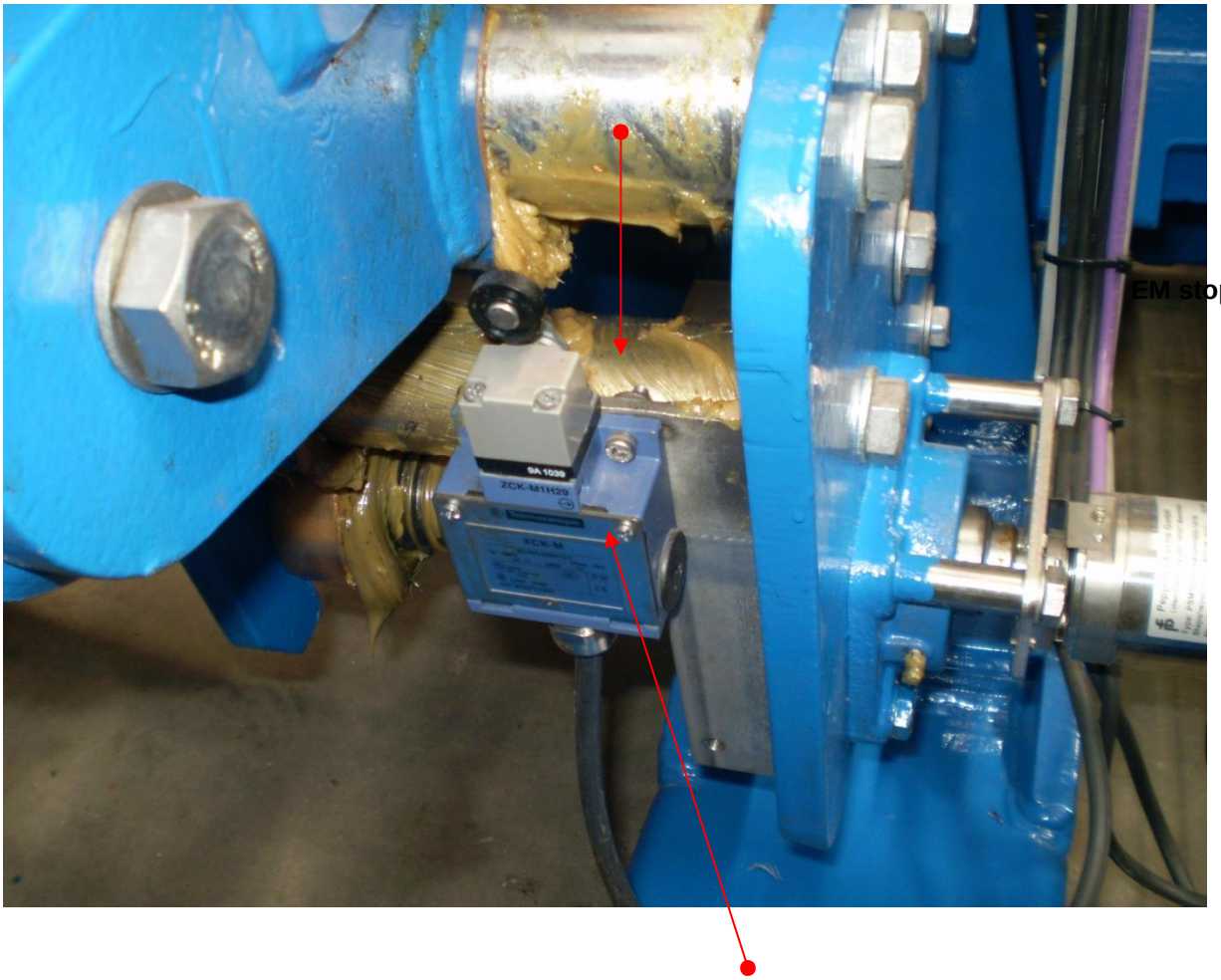
Encoder - Drum:

Encoder – level wind



Caution axle on encoder may never be exposed to axial forces

End stops



Level wind – end stop

Level wind is equipped with 2 pc. safety end stops.
Turning points on level wind are set in the PLC software.
The end stops are only backup in case of malfunction during operation. They should not get in contact with the trolley under normal circumstances.

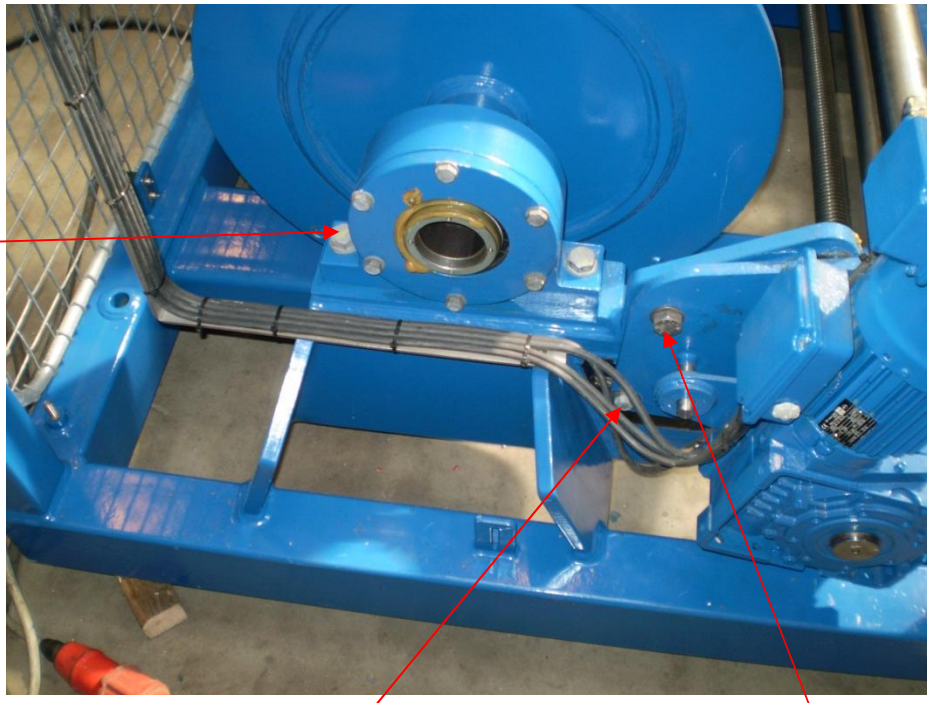
4.4 Flash light

When the yellow flash is on then the winch is activated

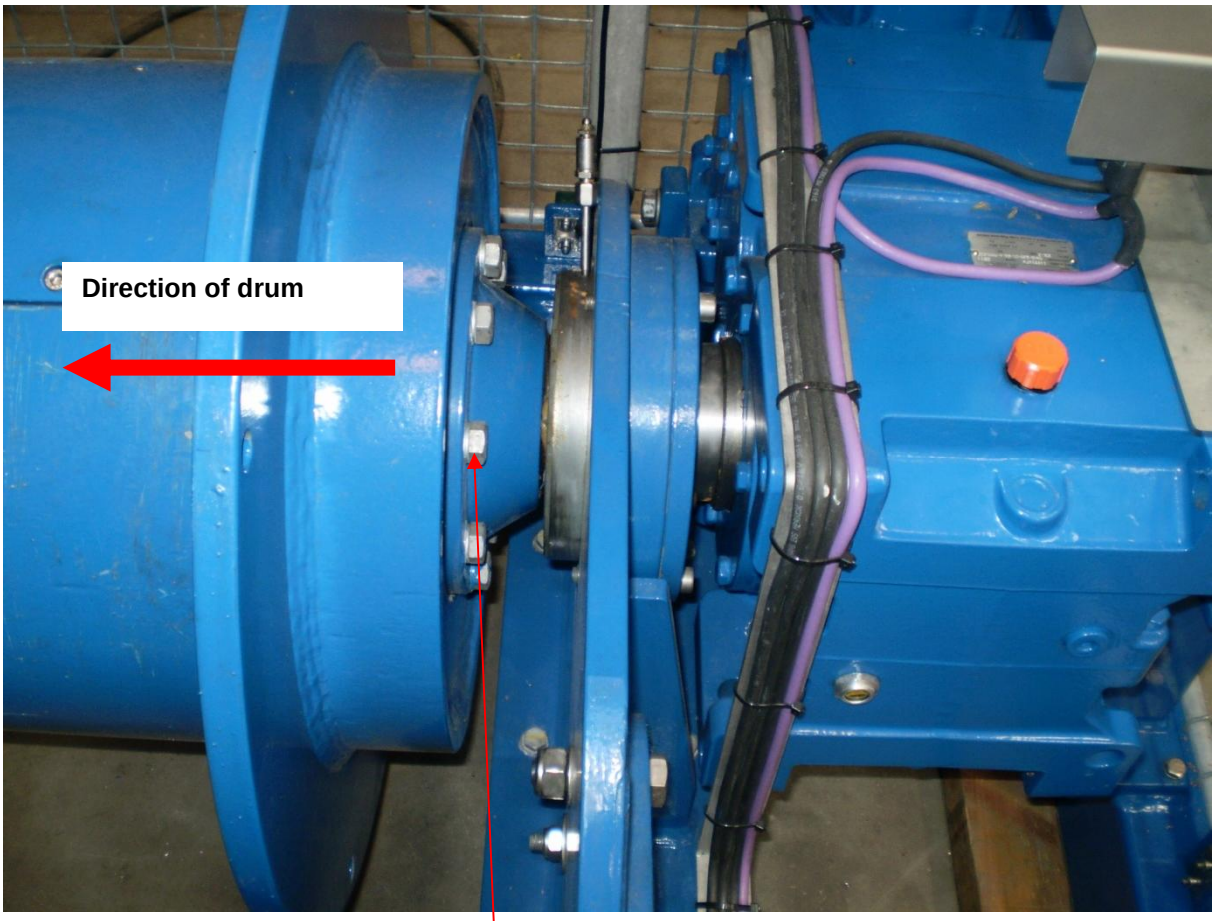
When the red flash is on then the EM is activated

4.5 Change Drum

The way the drum should be changed is that 2 shackles have to be mounted in the drum flanges, in the holes, and then carefully tighten your lifting gear wire/chain. For preparing of lifting the drum. Then you have to loosen the levelwind and put it in the lowest position. Before the levelwind is loose a lever hoists should be attached to levelwind shaft and the beam above so the positioning is controlled.


Take bolts off
The M20 bolts should be tighten with 363Nm
3 bolts have to be loosened. In both ends of the levelwind
Loosened in both ends

In the gear end the bolts need to be removed and pulled in the direction of the arrow.



4.6 Safety

The winch is a dangerous power tool, which has to be use by skilled personnel with the necessary training.

- Keep away from all rotating objects
- Only trained personnel to operate winch
- If untrained personnel is to work around the winch during operation access to winch are to be prevented by safety guards
- Area in front and back of winch are to be marked as “No Access Area”
- Never try to repair electrics while the power is on
  The main switch must be turned off and secured with a lock before any
  Repairs are performed
- Use the winch in the softest operation possible, this prolongs lifetime for
  the components and increases safety
- Always use the delivered lifting sling for lifting frame and winch
- Use the recommended spares, no guarantee is granted if others are used
- Skilled craftsmen must perform all services and repairs
- Keep the winch in good condition and be aware of any noises that might indicate that a mall function is under development
- The winch can be stopped any time by pressing the emergency stop
- If the safety guards are removed then the emergency stop should be activated.

4.6.1 Check of Main Electric motor brake

The motor is with an electrical brake. This is mainly maintenance-free. The rotor is robust and wear-resistant. This ensures a particularly long lifetime. However it is of course subject to operational wear. If the rotor becomes warn, and the function of the brake can no longer be guaranteed, it is possible to bring the brake back to its original condition, by replacing the rotor.

Please check the quality of the counter friction surface when replacing the rotor.

The wear condition of the rotor can be specified by measuring the release voltage or by measuring the rotor thickness on the dismantled brake according to Table 1 and Table 2. On size 100 there is an air gap inspection opening in order to avoid dismantling the heavy brake.

The release voltage may be up to max. 90% of the nominal voltage on a warm brake.

Every 6 Months or 1000 running hour (whatever occurs first) maintenance:
The amount of wear on the rotor must be examined during the regular inspection intervals, which should occur, every 6 Months or 1000 running hour (whatever occurs first) maintenance.

The inspection should include:

- Inspection of the rotor thickness (wear)
- Inspection of the rotor toothing and the hub for smooth running, higher backlash and damage.
  - Max. permitted rotor torsional backlash on the hub:
    Sizes M2 – M32 → 0,5°, sizes M60 –M500 → 0,3°.
    Inspection of engaged brake and load-free output by turning motor shaft.
- Inspection of armature disk and flange plate or the friction surface of the motor shield for plane parallelity and wear (excessive formation of grooves)
- Brake cleansing

See Technical data table 1 below; 'Size 100': last two columns.

Table 1 - Technical Data

	Suitable for Standard Brakes Type 891.0_ _._ and 891.2_ _._					
	Mass moment of inertia J Hub + Rotor for d_{max} [kgm^2]		Friction work $Q_{r\,0.1}$ (per 0.1 mm wear)	Friction work $Q_{r\,tot.}$ (max. possible friction work in relation to nominal air gap)	Rotor thickness "new"	Minimum rotor thickness (limit value for braking torque 100 %)
Size	Type 891.0_ _._	Type 891.2_ _._	[J/0,1]	[J]	[mm]	[mm]
2	0.12×10^{-4}	0.1×10^{-4}	35×10^{6}	95×10^{6}	6.05	5.8
4	0.21×10^{-4}	0.17×10^{-4}	40×10^{6}	100×10^{6}	6.05	5.8
8	0.67×10^{-4}	0.58×10^{-4}	65×10^{6}	162×10^{6}	6.9	6.65
16	1.74×10^{-4}	1.53×10^{-4}	100×10^{6}	500×10^{6}	8.0	7.5
32	4.48×10^{-4}	4.1×10^{-4}	130×10^{6}	600×10^{6}	10.4	9.9
60	6.74×10^{-4}	–	130×10^{6}	700×10^{6}	11.15	10.6
→ 100	16.54×10^{-4}	–	140×10^{6}	840×10^{6}	14.0	13.4
150	31.68×10^{-4}	–	150×10^{6}	950×10^{6}	15.5	14.9
250	61.82×10^{-4}	–	160×10^{6}	1000×10^{6}	17	16.4
500	222.6×10^{-4}	–	200×10^{6}	2000×10^{6}	18.5	17.9

The stated values $Q_{r\,0.1}$ and $Q_{r\,tot.}$ are only approximate values for specific friction work < 0.5 J/mm^2 and sliding speeds < 10 m/s.

Table 2 - Technical Data

Size	Referring to Holding Brakes Type 891.1_ _._			
	Mass moment of inertia J Hub + rotor for d_{max}	Friction work $Q_{r\ 0,1}$ (per 0,1 mm wear)	Friction work $Q_{r\ tot.}$ (max. possible friction work in relation to nominal air gap)	Rotor thickness "new"
	[kgm^2]	[J/0,1]	[J]	[mm]
2	0.12×10^{-4}	7×10^{6}	7×10^{6}	6.05
4	0.21×10^{-4}	8×10^{6}	8×10^{6}	6.05
8	0.67×10^{-4}	13×10^{6}	13×10^{6}	6.9
16	1.74×10^{-4}	20×10^{6}	20×10^{6}	8.0
32	4.48×10^{-4}	30×10^{6}	45×10^{6}	10.4
60	6.74×10^{-4}	65×10^{6}	130×10^{6}	11.15
→ 100	16.54×10^{-4}	70×10^{6}	170×10^{6}	14.0
150	31.68×10^{-4}	75×10^{6}	300×10^{6}	15.5
250	61.82×10^{-4}	80×10^{6}	350×10^{6}	17
500	222.6×10^{-4}	100×10^{6}	500×10^{6}	18.5

The stated values $Q_{r\ 0.1}$ and $Q_{r\ tot.}$ are only approximate values for specific friction work < 0.5 J/mm^2 and sliding speeds < 10 m/s.

4.7 Section - Maintenance Journal

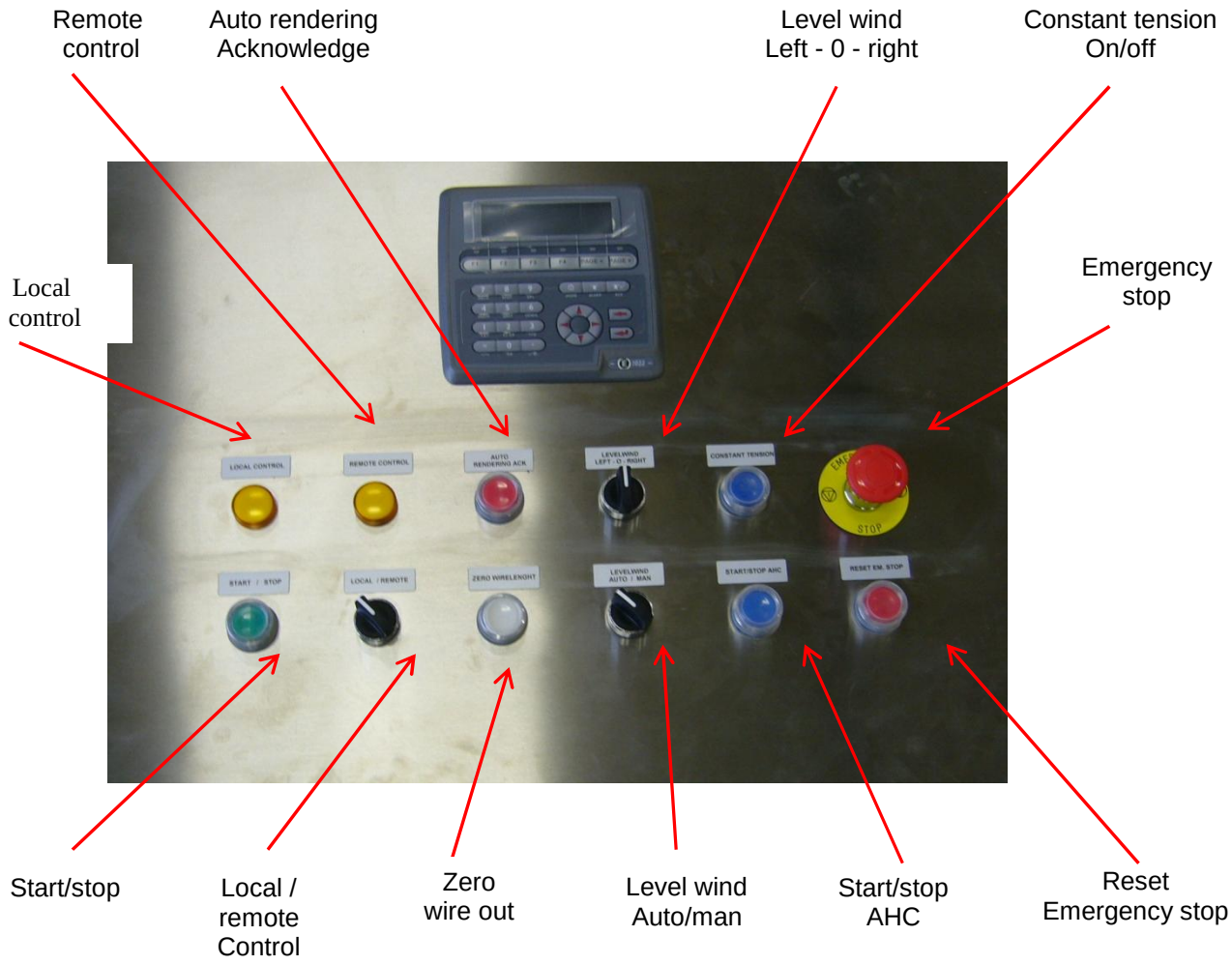
Maintenance Journal

	Date:	Sign.	Date:	Sign.	Date:	Sign.	Date:	Sign.	Date:	Sign.	Date:	Sign.	Date:	Sign.	Date:	Sign.	Date:	Sign.	Date:	Sign.
Check daily																				
Check if the level wind spindle and guide are greased and grease if necessary																				
Visual inspection of major bolt connections.																				
Check the winch for unusual noises.																				
Check for oil leak.																				
Check Inverter																				
Montly or 200 running hours whatever occours first:																				
All bearings must be greased on a regular basis at least every month.																				
Grease encoder chain drive using a soft brush.																				
Grease drive on drum in drive end.																				
For every 6 month or 1000 running hours whatever occours first:																				
(First service after 2 Months or 300 running hours whatever occurs first.)																				
Check for leaks in the gear - repair if necessary.																				
Check main bolt connections on the winch - use a tourqe-limiting tool.																				
Greasing as necessary.																				
Function test.																				
Replenishment of grease.																				
Check and clean fans in electrical cabinets																				
Check and clean heat element and fan in brake resistor																				
Check brake in rotor.																				
Yearly																				
Change gear oil.																				
Check and tighten all bolts and screws in electrical components																				
(Change fans in electrical panel each 3 year)																				
(Change smoothing capacitor in inverter each 5 year)																				
(Change aluminium capacitors on PCB in inverter each 5 year)																				
(Battery in PLC & MRU must be replaced each 5 year)																				
(Replace fuses in inverter each 10 year)																				
(Change bearing in main motor each 20000 running hour)																				
(Change bearing in fan in brake resistor each 20000 running hour)																				

Always be aware of faulty noises that could indicate damage to one or more components.

5 Section - Software manual

5.2 Main switchboard



Constant tension mode works only in local mode, and there need to be more than 30 meter of umbilical out. When constant tension is activated the actual tension in the umbilical will be the setpoint.

AHC have a safety feature so it only works when the wire out is larger than 30 meter. When AHC is activated the button will start flashing until it is fully ramped in, and then the light

will be steady. When switching the AHC off the button will start flashing until it is fully ramped out and the light will be off.

When the load in the wire is larger than the setting for auto rendering and the wire out is larger than 30 meter, the auto rendering will be activated, the winch will switch in to tension mode with the setting for auto rendering as setpoint.
When the auto rendering is activated the winch will start to pay out, and the light will be steady red, if the load in the wire then getting lower than the setpoint, the winch will start to pay in until it reach the point where the auto rendering had been activated and it will change to speed mode, and the light will start flashing.

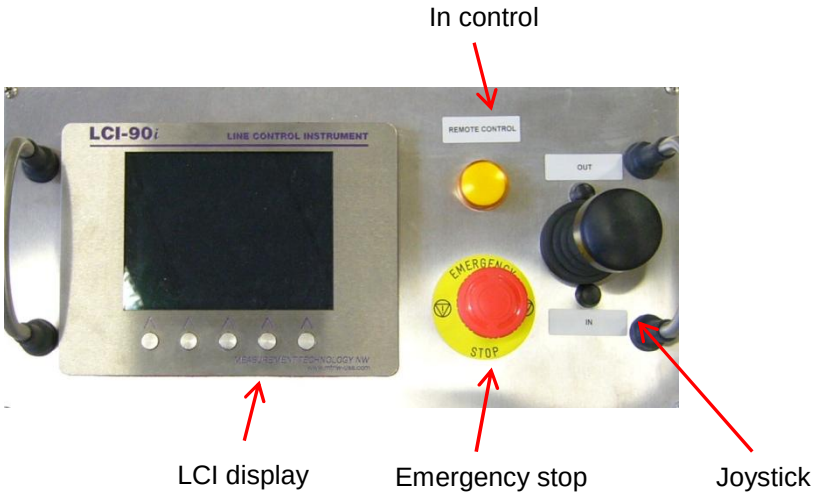
The auto rendering can be acknowledge when the wire load is smaller than the setpoint, and when the auto rendering is acknowledge the winch is changed to speed mode. When the auto rendering have been activated and before it is possible to operate the winch from the joystick the auto rendering have to be acknowledge.

To zero wire out the button have to be hold down for 3 seconds.

The level wind can be operated manually by switching the level wind in manually and the operate the level wind with the switch for left and right. When the level wind is changed to automatic the level wind will move back to the position there is calculated in the PLC.

If emergency stops have been pressed, it needs to be reset again before it is possible to start the winch.

5.2.1 Remote control

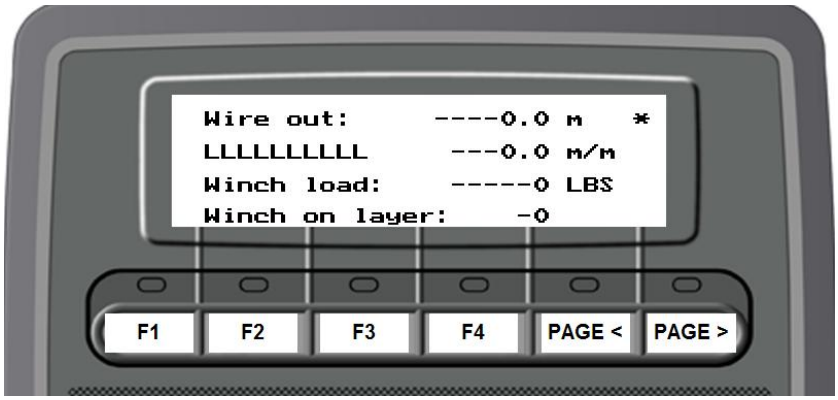


When remote control is selected, “In control” will light, and if the winch is started at the main switchboard, the drum can be controlled from the joystick.

The LCI display will show wire out, wire speed and wire tension.

5.2.2 Display menu

“Page <” and “Page >” is active on all pages except for the alarm pages.



Page 1

On this page you get information about winch:
1. Wire paid off the drum after zero set.
2. Direction of the winch (paying in, paying out).
3. Wire speed in meter / minute.
4. Wire load in LBS.
5. Number of layer.
6. In the upper left corner a “*” indicate if the level wind is in the “Dead band zone”.

Pressing F3 will logon the system, a prompt for password shows up.

Dead band zone:
The “Dead band zone” is ¼ turn at each end of the drum were the Level wind does not move.

System log on:

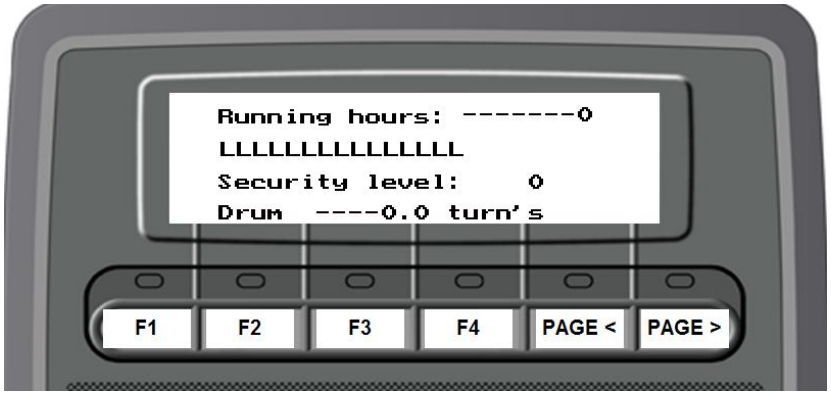
Page 1, 2, 3 and 4 is accessible without logging on the system.

To get access to the set-up pages you must log on the system.

To log on the system press F3 on any of the first 2 pages and types the code7570 then press ENTER.

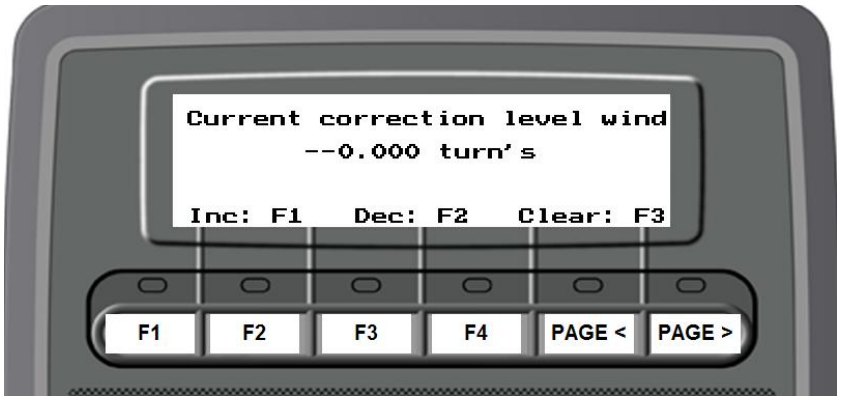
You are automatically logged out when leaving page 5, 6 and7.

To access page 8 - 14, logon with service password.



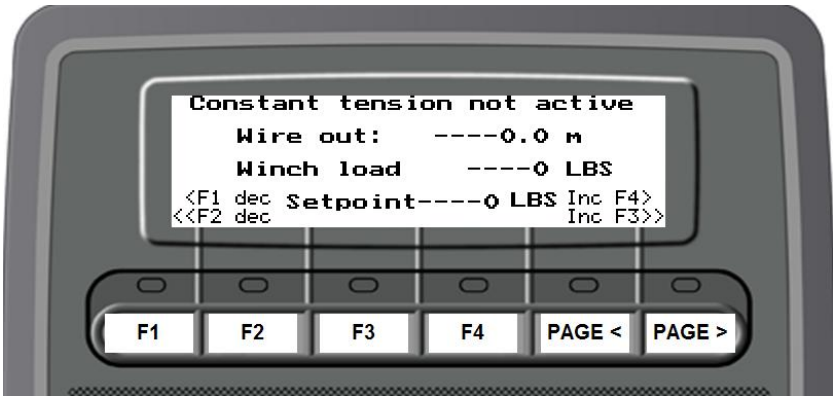
Page 2

1. Total running hours
2. Actual status (running or stopped
3. Security level: 0, 1 or 2
4. Number of cable turns on drum.



Page 3

The level wind is before spooling set to zero correction and the start value is stored in the PLC. If moving the level wind away from the basic position the corrections is shown on this page. You can move the level wind left/ right by pressing F1/F2.
The value can be set to zero by pressing F3 twice within 5 sec, the LED's above F3 will indicate by flashing red after first press and shift to steady red after second press.
The value can be set between –10 to + 10 windings on the drum.

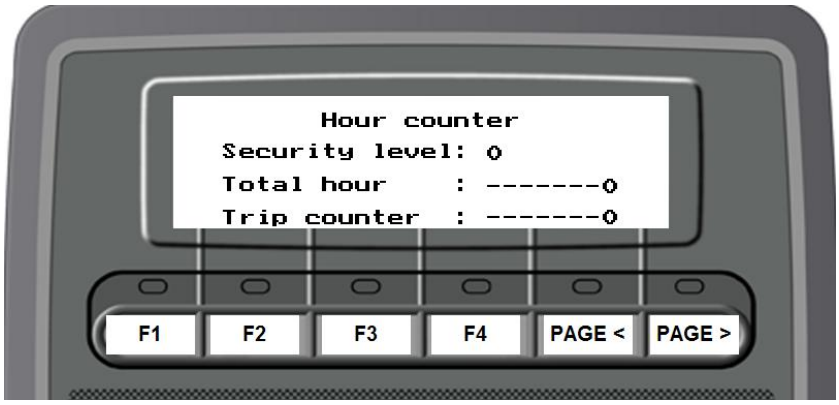


Page 4

When the tension function will be activated at the front of the switchboard, the actual tension in the umbilical will be set as set point, on this page it is possible to adjust the set point up and down, when the tension function is active.

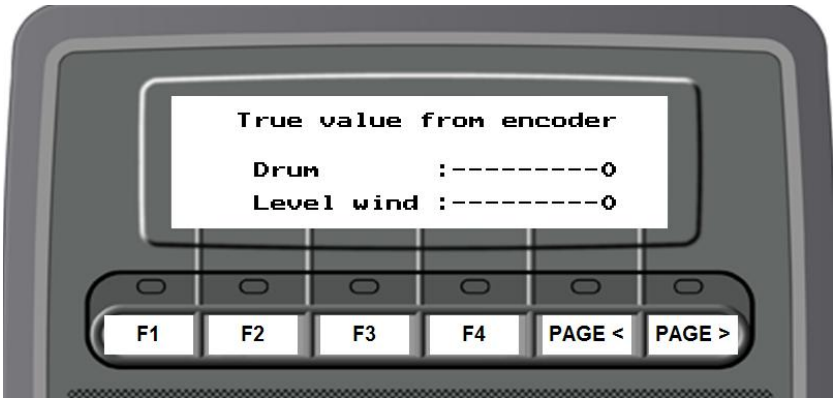
F1 and F2 is used to adjust the set point down, F1 adjust in 5 LBS step and F2 in 50 LBS step.
F4 and F3 is used to adjust the set point up, F4 adjust in 5 LBS step and F3 in 50 LBS step.
It is also possible to type the wanted set point and then press enter.

The tension function can only be active in local mode and when the wire out is larger than 30 meter.



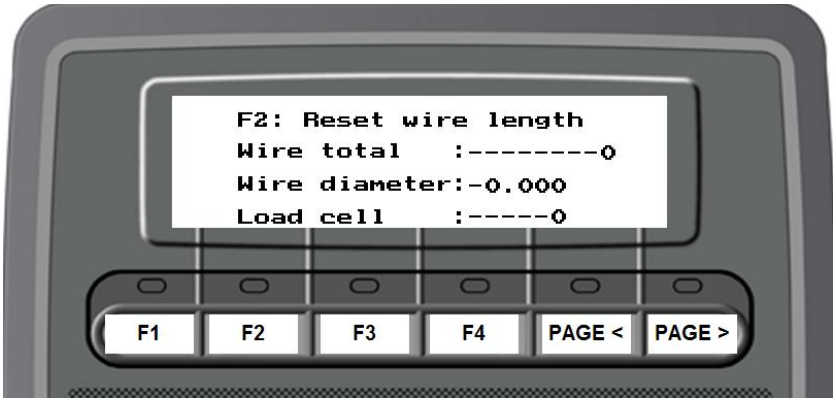
Page 5

Hour counter for winch, the trip counter can be reset by pressing F1 twice within 5 seconds.



Page 6

This is only for control of encoders' true position and can be used in case of changing an encoder.



Page 7

When all wire are spooled on drum, you need to save the amount of “wire on drum” to calculate the Wire length of drum. To do this press F2 twice within 5 sec, the LED’s above F2 will indicate by flash red / steady Green. After first press the led flash Red, after second it goes steady Green. The led goes of within 5 sec from first press of F2.

To clear the stored “Wire on drum” press F2 and then F3.

Wire diameter is used for controlling level wind position and for calculating drum length.
The value is entered in 1/1000 of a mm. i.e. 9.500 for 9.500 mm. Use the numerical keypad’s to enter a value and press ENTER to accept.

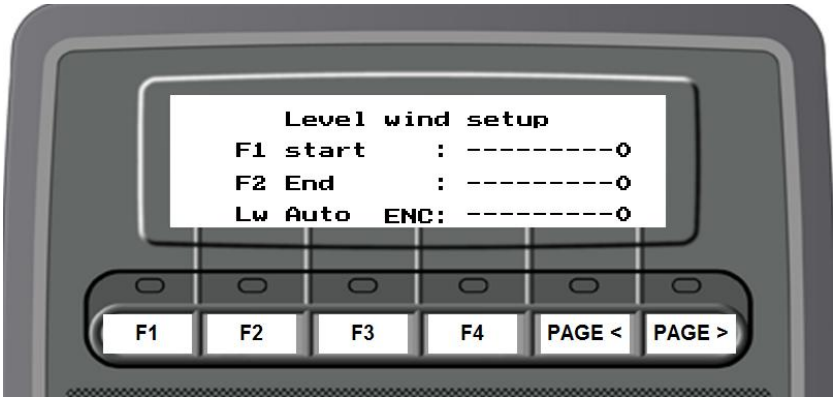
The wire diameter is multiplied with the number of turns from the beginning of the first layer and over all layers on the drum to the current position on the current layer. This gives the position where the level wind is supposed to be.

Wire diameter can be changed under operation and will take action after pressings ENTER.
The value in Load cell is used for calculating the value shown from load cell.

The load input is multiplied with figures in “Load cell:” and divided by 2500.
The known load is 1000 Kg and the display shows 1100 Kg
The value in display is f. x. 2500
1000 / 1100 * 2500 gives 2272 type this in and check the Winch load.

Spooling of cable or changing cable:

The winch is fitted with to absolute encoders, one giving position of the level wind and the winch drum encoder giving the cable position of the winch drum. On this page the turning positions for the level wind are entered.
(These settings should not be changed during normal operation)



Page 8

Set level wind in manual with S7. With the level wind in manual S8 moves the level wind forward and backwards.

Move level wind to start position (start pos. of Lebus) and press F1 twice within 5 sec to save the position. The led above F1 will start to flash at the first press and go steady on second press, to indicate that the position is saved. Start position have to be set first.

Move level wind to end position and press F2 twice within 5 sec to save the end position.
The led above F2 will start to flash at the first press and go steady on second press, to indicate that the position is saved.

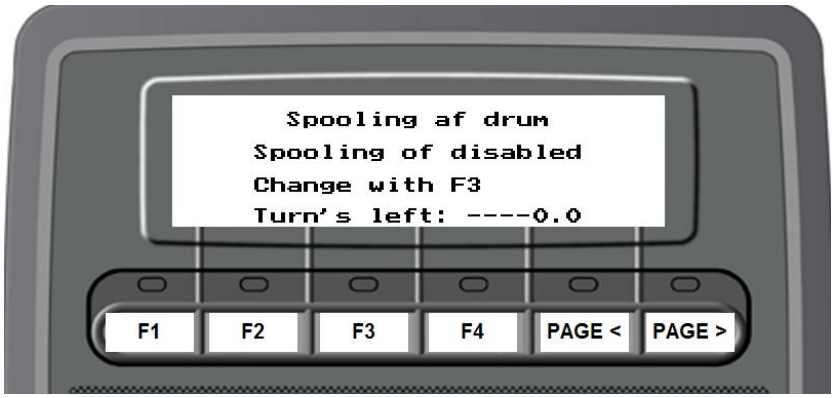
The LED switches of automatically after 5 sec.

The start and end positions are used for calculating level wind movement and the length of the drum. Those settings can be changed at any time without interfering with other settings, but will change level wind position and wire length calculation.

It is therefore NOT recommended to change settings under operation. After setting the turning position go to the page where the data on the cable is entered.

Unspooling override:

For security reasons there is an unspooling safety stop. The winch is stopped before all the cable is spooled of the drum. To make sure that the cable can be re spooled, if the cable need to be changed an override is possible.

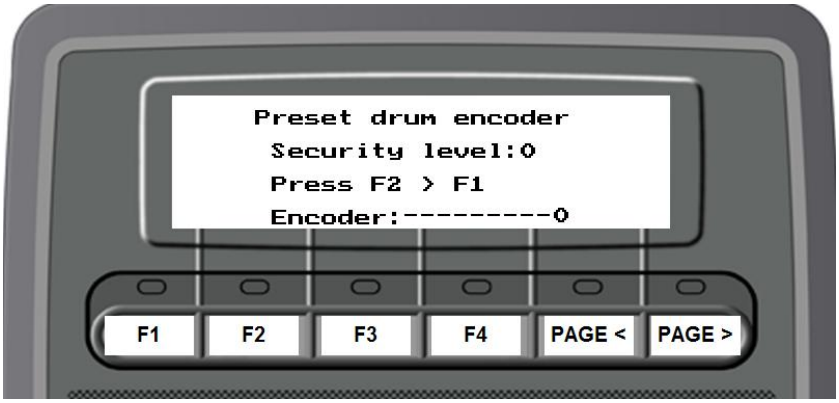


Page 9

This page shows wire turn's left on drum and status of limit for spooling the last 8 turns of the drum. F3 change status, and the LED above F3 turns on while the limit is disabled.

The override is only active while this page is displayed.

It is still <u>not</u> possible to spool more than the last turn off the drum (the turn's left can't go below zero).



Page 10

Function button F2>F1 is used to preset the drum encoder <u>BEFORE</u> the wire is attached to the drum but with the drum in the correct start position.

<u>Do not press F2>F1 with wire on drum.</u>

To preset drum encoder, turn the drum until the cable inlet point to the Level wind. Then press F2 and then F1 within 5 sec. The LED above F1 will indicate by flash Red after first time and shift to steady Green after second time. The led switch off after 5 sec.

Change of drum:

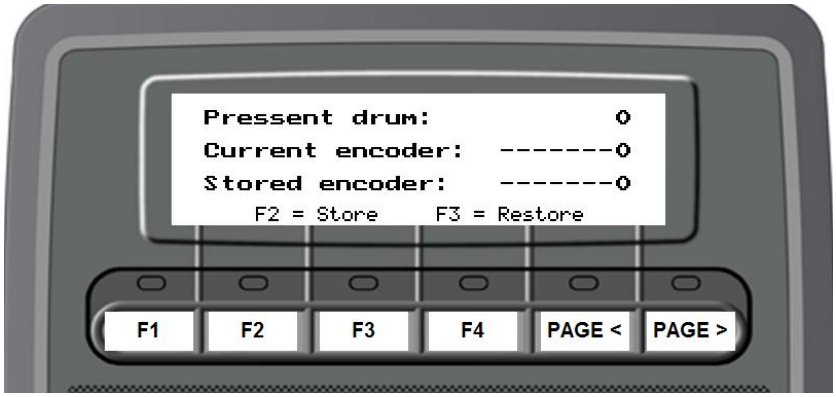
When starting spooling cable on the drum, the drum encoder has to be preset, when the drum is in the right position. See page 10 how to preset encoder.

When the drum have to be changed, the value from the drum have be stored in the plc (in this example it is drum nr. 1 there have to be taken off the winch, and drum nr. 2 there have to be installed on the winch, and there is cable on drum nr. 2). Enter 1 in present drum and then press enter, then there have to be pressed F2 twice within 5 sec to store the value from the encoder. The led above F2 will start to flash at the first press and go steady on second press, to indicate that the position is saved.

When the value is stored in the PLC the drum may not be turned and not allowed to take wraps of the drum.

Now remove drum nr. 1 and install drum nr. 2 at the winch and it are still not allowed to operate the winch.

When drum nr. 2 are installed, enter 2 in present drum and then press F3 twice within 5 sec to restore the value to the encoder. The led above F3 will start to flash at the first press and go steady on second press, to indicate that the value is restored to the encoder. Now it is allowed to operate the winch again.

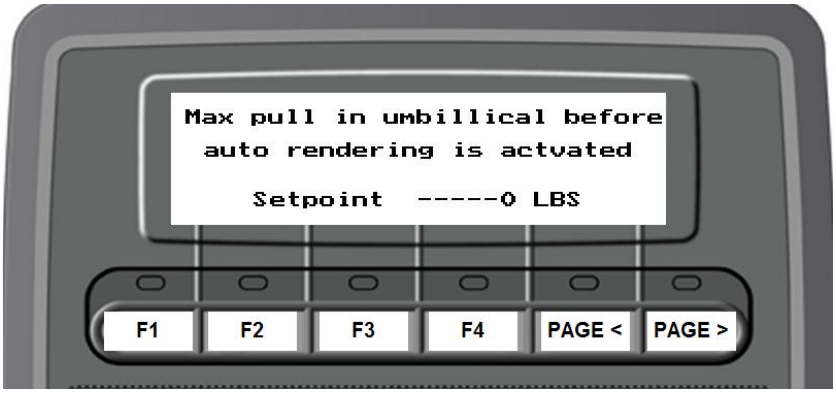


Page 11

Present drum indicates witch drum there is active, the winch is able to handle 3 different drums, but the drums need to have the same dimensions. Current encoder shows the current value from the drum encoder. Stored encoder show the stored value for the drum encoder at the present drum.

The drum may not be turned when the drum not is installed on the winch

Wraps of cable on the drum may not be changed when the drum not is installed on the winch.



Page 12

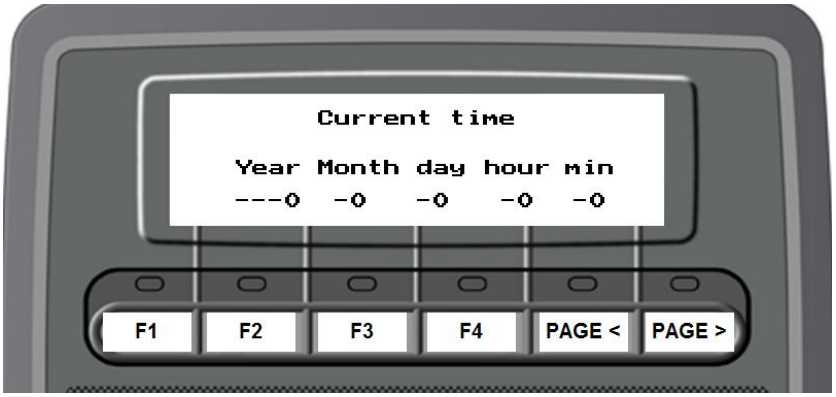
The winch is fitted with an auto rendering function, where the max pull in the cable can be adjusted before the auto rendering function is being activated.

The set point can be adjusted from 100 to 3400 LBS for the MASH 2000.

When the load in the wire is larger than the setting for auto rendering and the wire out is larger than 30 meter, the auto rendering will be activated, the winch will switch into tension mode with the setting for auto rendering as set point.

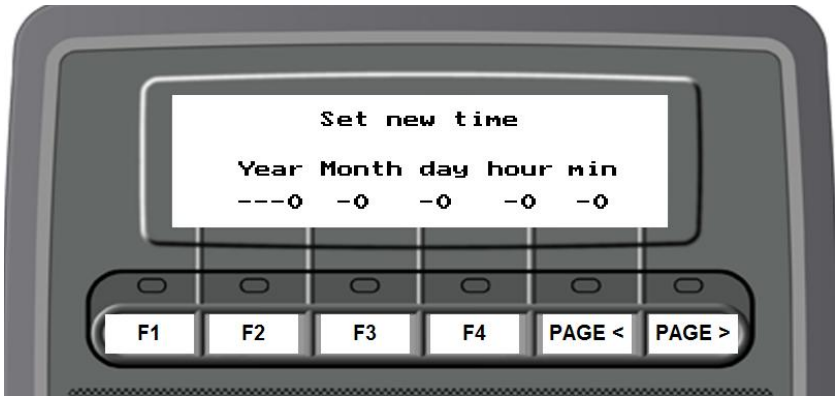
When the auto rendering is activated the winch will start to pay out, and the light will be steady red at the lamp at the main switchboard, if the load in the wire then getting lower than the set point, the winch will start to pay in until it reach the point where the auto rendering had been activated and it will change to speed mode, and the light will start flashing.

The auto rendering can be acknowledge when the wire load is smaller than the set point, and when the auto rendering is acknowledge the winch is changed to speed mode. When the auto rendering have been activated and before it is possible to operate the winch from the joystick the auto rendering have to be acknowledge.



Page 13

The current time of the PLC is shown.



Page 14

To set a new time adjust the time with the keypad, when the correct time is entered hold F1 down for 5 second and the time will be stored in the PLC.

Alarm and fault indication

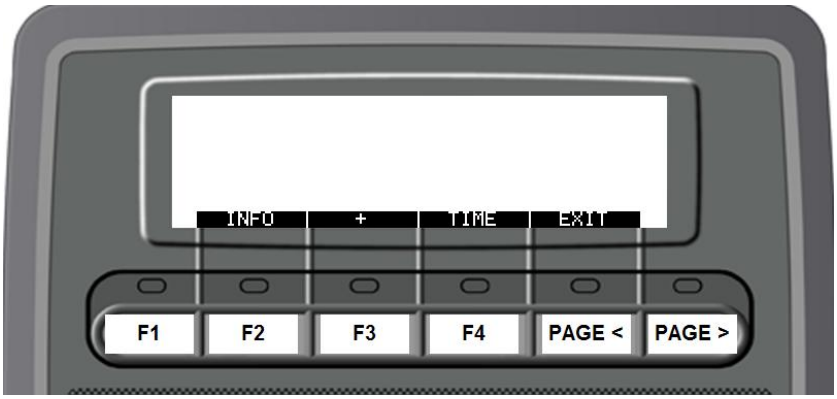
If an alarm is present a text “alarm” is showed in the right upper corner of the display, pressing the “LIST” button brings up the alarm page.

The following alarms are defined:

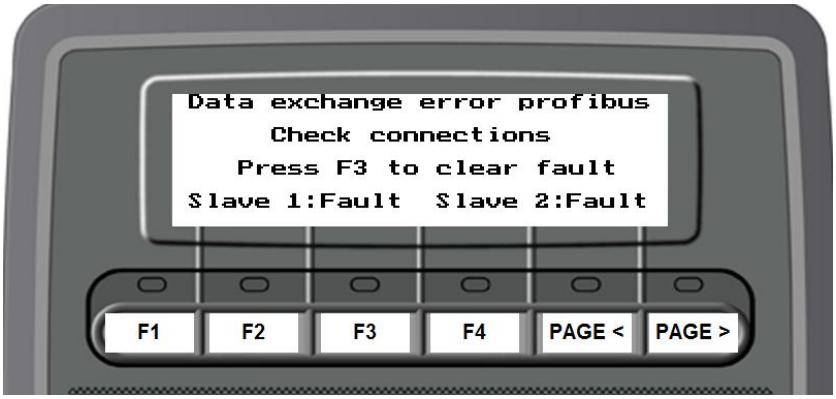
1: Over max layer
2: Emergency stop
3: Thermistor winch
4: Fault analogue input
5: Fault analogue output
6: Profibus fault
7: Fault winch encoder
8: Fault level wind encoder
9: LW in manual
10: Fault level wind position
11: Level wind on limit
12: Fault MRU
13: Auto rendering activated
14: No compact flash card
15: Fault data logging module
16: Wire broken load cell

Alarms can have the following status.

Symbol	Status
*	Active, Unacknowledged
$	Active, Unacknowledged
-	Active, Acknowledged
<blank>	Inactive, Acknowledged



This alarm pages is not selectable from function keys and switch automatically back to main page when fault is restored.



Fault on Profibus.

In case of a slave is offline, this page shows up with the slave number. Press F3 to reset.

5.2.3 Data logging

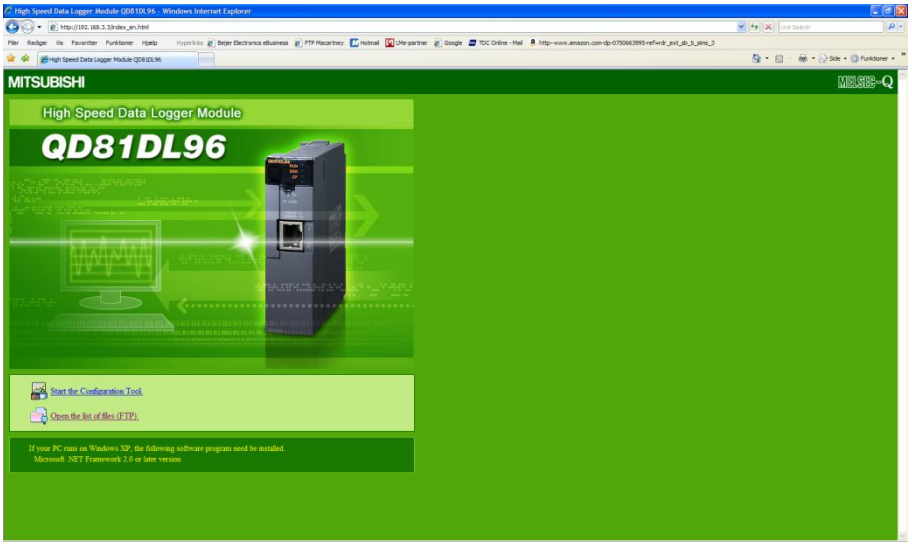
There is a FTP server at the data logger module, and the IP address for the data logger module is: 192.168.3.3

There will be created a new file for each 30 minutes. Each file will have 36000 sampling because there is logged with 20Hz. At the memory card there can be 1100 files, when the card is full, the file with the lowest number will be deleted and logging continues.

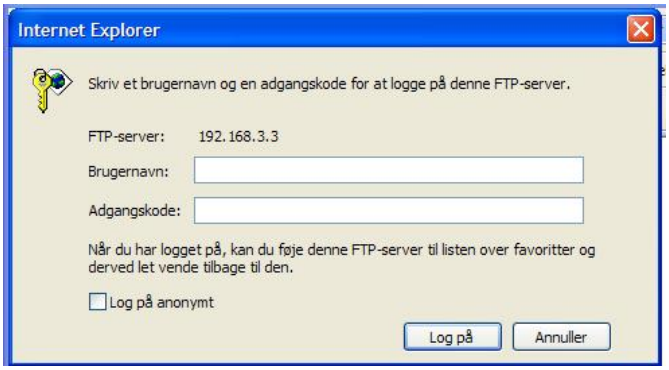
The logging is active when the wire out is larger than 30 meter, even if the winch is stopped.

To access the FTP server connect the data logger module Ethernet port to the network or connect a crossed cable between the data logger and the PC.

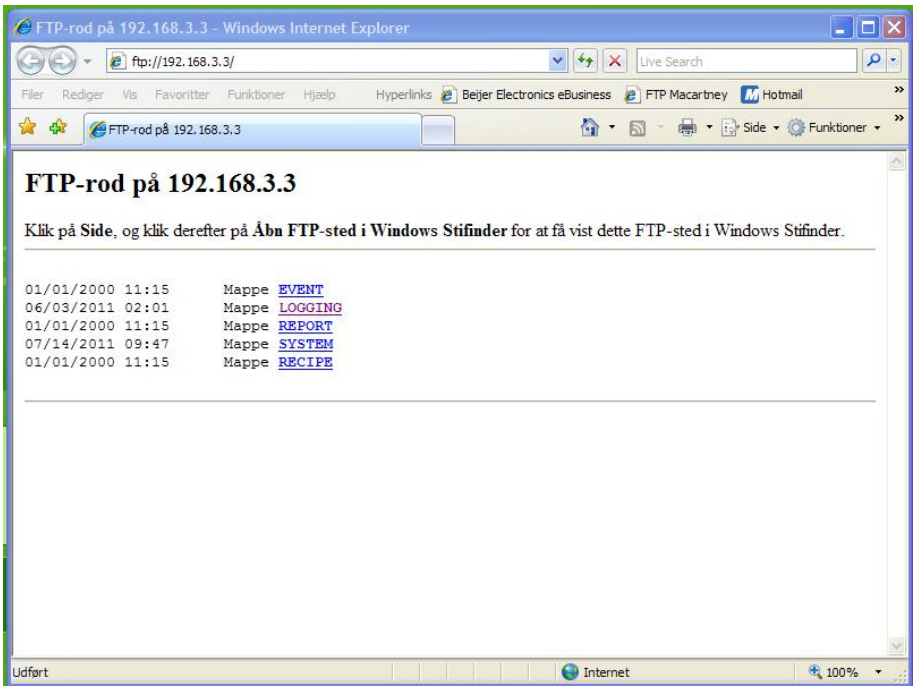
Then enter “192.168.3.3” in a browser and press enter, then the following picture will be shown.



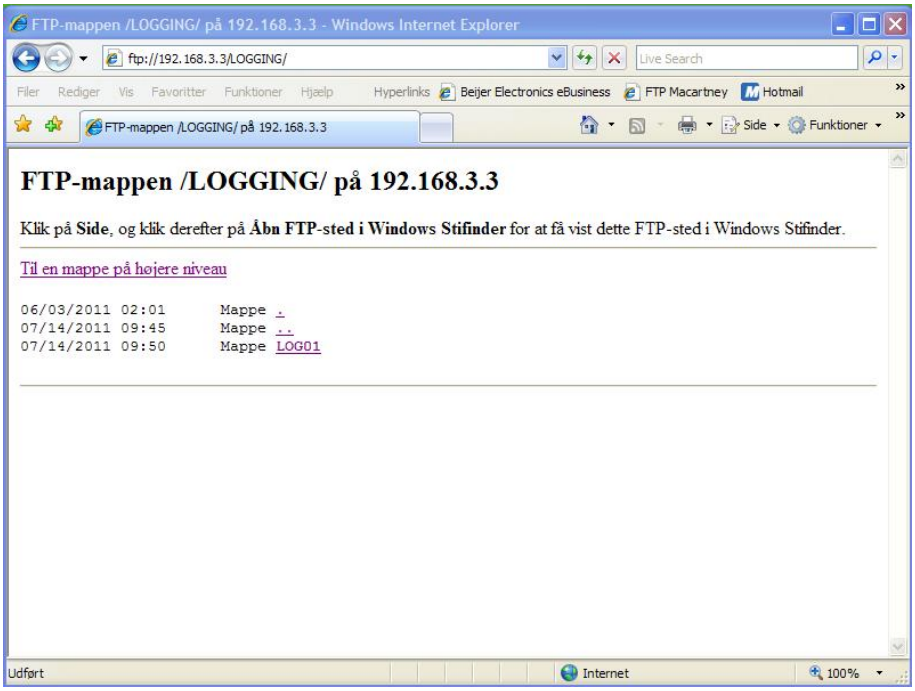
Press ”Open the list of files (FTP) and the next picture will be shown.


Internet Explorer
Skriv et brugernavn og en adgangskode for at logge på denne FTP-server.
FTP-server: 192.168.3.3
Brugernavn:
Adgangskode:
Når du har logget på, kan du føje denne FTP-server til listen over favoritter og derved let vende tilbage til den.
Log på anonymt
Log på
Annuller

Enter the following user name and password and the following picture will be shown.
User: User
Password: 75707570


FTP-rod på 192.168.3.3 - Windows Internet Explorer
ftp://192.168.3.3/
FTP-rod på 192.168.3.3
FTP-rod på 192.168.3.3
Klik på Side, og klik derefter på Åbn FTP-sted i Windows Stifinder for at få vist dette FTP-sted i Windows Stifinder.
01/01/2000 11:15 Mappe EVENT
06/03/2011 02:01 Mappe LOGGING
01/01/2000 11:15 Mappe REPORT
07/14/2011 09:47 Mappe SYSTEM
01/01/2000 11:15 Mappe RECIPE

Here are 5 folders and the logged files will be in the folder named “LOGGING”


FTP-mappen /LOGGING/ på 192.168.3.3 - Windows Internet Explorer
ftp://192.168.3.3/LOGGING/
FTP-mappen /LOGGING/ på 192.168.3.3
FTP-mappen /LOGGING/ på 192.168.3.3
Klik på Side, og klik derefter på Åbn FTP-sted i Windows Stifinder for at få vist dette FTP-sted i Windows Stifinder.
Til en mappe på højere niveau
06/03/2011 02:01 Mappe .
07/14/2011 09:45 Mappe ..
07/14/2011 09:50 Mappe LOG01

In the folder “LOGGING” there will be another folder called “LOG01”, in this folder all the logged files are stored.

5.2.4 Troubleshooting

Level wind is not moving during operation.

- Check power supply to the box.
- Check if there are any fault messages on the display.
- Check if there is a profibus fault on the display.
- Check the level wind not is in Manuel.
- Check limit switches, they may not be activated.
- Check analogue output PLC module E8, CH3.
- Check the fuse Q2.
- Check the chain for drum encoder.

Length counter will not count.

- Check power supply to the box.
- Check if there are any fault messages on the display.
- Check the chain for drum encoder.
- If there is a profibus fault on the display.

5.3 How to replace umbilical the drum?

The winch will be delivered with the cable spooled on the drum with back tension. If it is required to replace umbilical on the drum, please attend the following procedure to spool on the cable in a correct manner. Before spooling on the cable, please make sure, that the correct cable datasheet is present, and the cable diameter is known.

Setting the cable diameter:

1) Start the winch
2) Login on E1022, with password level 2.
3) Go to section 5.2.2 panel page 7 save wire length
4) Enter the wire diameter in 1/100 mm. (35,4 mm wire will be entered as “3540”), press enter to approve the setting. MacArtney recommend that the diameter input is set to app. 1,04 x actual diameter of cable, which will give us 3682 as recommended value. (Visual inspection required to determine the correct value).
5) The wire diameter has been set.

Setting of the turn points of the level wind.

1) Go to section 5.2.2 panel page 7 level wind setup
2) Set the level wind in manual, by turning the switch on the panel. The display will indicate that the level wind is in manual. The first step is to save the set point on the right side.(view from drum to level wind.
3) Adjust the level wind, by activating the switch on the control panel. The level wind is to be adjusted so the left roller is equal to the inner flange of the drum + ½ the cable diameter, refer to
4) Figure 3 – Level wind at left end point. Winch seen from above. The ½ cable length distance is introduced to prevent the umbilical of stacking on the second turn.

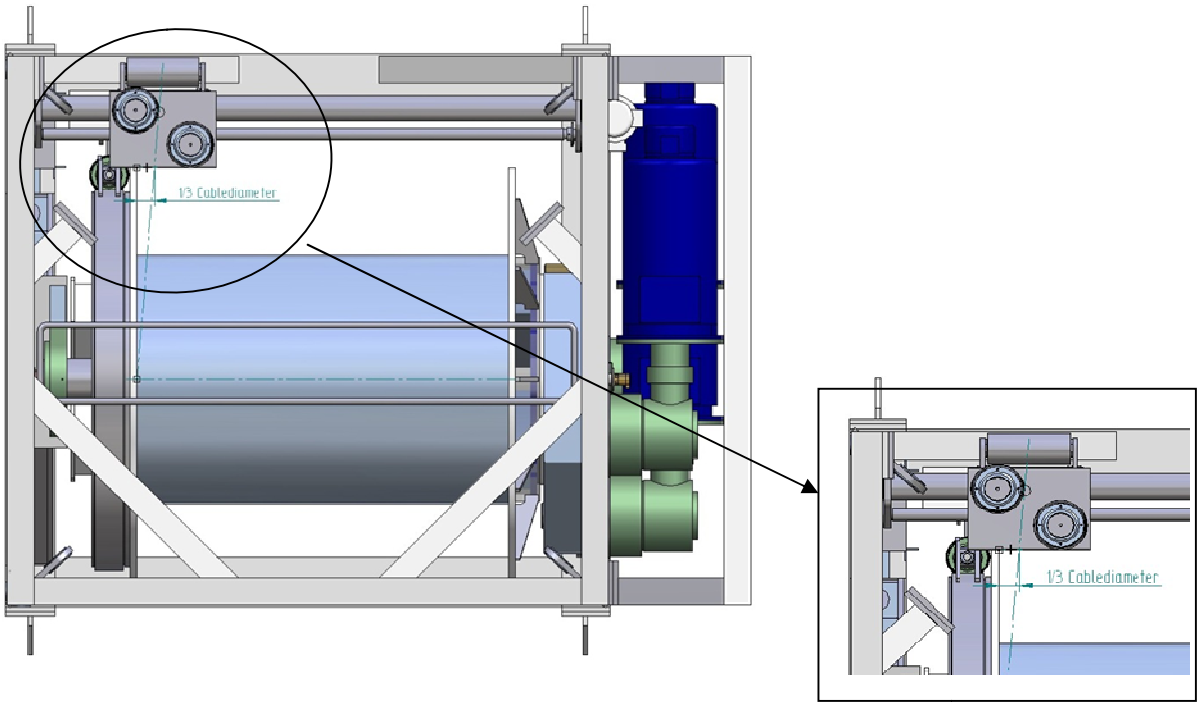


Figure 3 – Level wind at left end point. Winch seen from above

5) Press F1. The red LED on F1 will start flashing. Re-press F1, and the LED will illuminate green. If the F1-button is not re-pressed, the red LED will stop after 5 sec, and the preset has not been completed.

6) Adjust the level wind over to the right side by the switch on the control panel. The level wind must be aligned, so the right roller is equal to the inner flange of the drum + ½ the cable diameter; refer to **Figure 4 - Level wind at right end point. Winch seen from above Error! Reference source not found.**

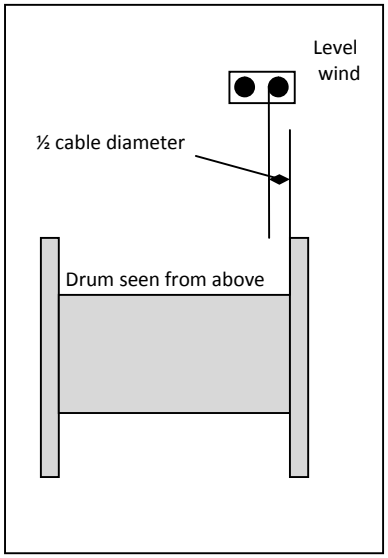


Figure 4 - Level wind at right end point. Winch seen from above

7) Press F2. The red LED on F2 will start flashing. Re-press F2, and the LED will illuminate green. If the F2-button is not re-pressed, the red LED will stop after 5 sec, and the preset has not been completed.
8) End point has been set.
9) By using the manual level wind switch, move the level wind back to the right side where the umbilical entry point to the drum, do not store set point again.

DO NOT STORE THE SETPOINTS unless the drum is empty of umbilical.

Setup of the drum

10) By using the joystick the drum will be turned to the correct position for cable entering the drum, refer to Figure 5 - Umbilical fastening point on drum

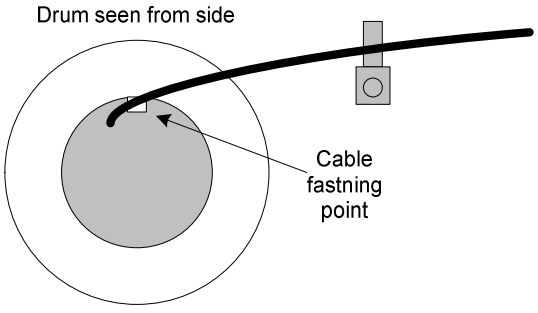


Figure 5 - Umbilical fastening point on drum

11) Go to section 5.2.2 panel page 10 preset drum encoder
12) Push the “Stop” button the winch
13) Press F2. The red LED on F2 will start flashing. press F1, and the LED will illuminate green.
14) The drum encoder has been preset to 0
15) Log out
16) Reset the cable length, according to the procedure.
17) Go to section 5.2.2 panel page 3 level wind offset
18) Verify “current corrections” is set to “00000”. If no, Press F3. The red LED on F3 will start flashing. Re-press F3, and the LED will illuminate green. If the F3-button is not re-pressed, the red LED will stop after 5 sec, and the reset has not been completed.
19) Go to section 5.2.2 panel page 1 shows info about wire and winch
20) A “*” in the right corner, indicates that the level wind is in an area, where the level wind is not intended to drive. The level wind will not be running the last ¼ turn at each layer.
21) Start the winch
22) The red LED above “Page <” flashes until there is 8 turns on the drum.
23) Set the level wind in “auto” mode.
24) Cable is fastened to the drum
25) Spooling can begin, without tension. Please note that it is not possible for the winch to pay out, when there are less than 8 turns on the winch. The cable length will be indicated as “-“.
26) When 80% of the first layer of the drum is spooled on, please stop.
27) Is the level in the correct position?
    a. If yes, the level wind is running perfect, please go to step 37.
    b. If no, the level wind needs to be adjusted, please go to step 32.
28) Login on E1022, with password level 1.
29) Go to section 5.2.2 panel page 7 save wire length
    a. If the level wind is in front of the cable = decrease cable diameter 1% of cable diameter.
    b. If the level wind is behind of the cable = increase cable diameter 1% of cable.
30) The level wind will move to the calculated position.
    a. If this position is perfect, please continue this procedure.
    b. If this position is not perfect, please go to step 33.
31) Log out.
32) Go to main page
33) Spool on the remaining cable. Check the spooling on drum regularly.

Store the amount of cable on winch.

34) Store the amount of cable on winch, by reset of the cable counter.
35) Go to section 5.2.2 panel page 7 save wire length
36) Press F2. The red LED on F2 will start flashing. Re-press F2, and the LED will illuminate green. If the F2-button is not re-pressed, the red LED will stop after 5 sec, and the preset has not been completed.
37) Log out.

The spooling has been completed.

5.4 How to spool off an umbilical

The winch has been designed to prevent all umbilical spooled off the drum. It is not possible for operator to un-spool the last 8 umbilical wraps on the winch drum, during normal operation mode. If it is required to completely un-spool all the umbilical, please follow this procedure.

Go to section 5.2.2 panel page 9 unspooling override

5.5 How to use and adjust tension.

The winch has been designed with a constant tension mode.

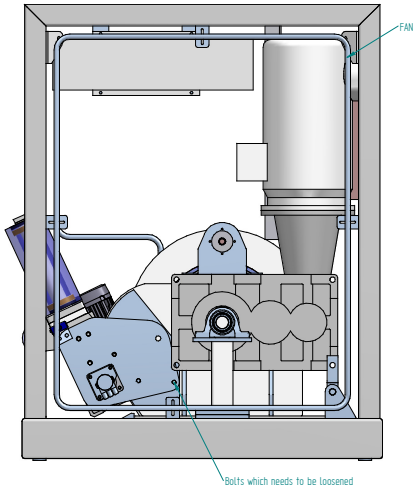
Constant tension during operation.
With the TMS deployed and in operation, it is possible to set the winch in constant tension. By pressing the CT button, the current tension is stored and will be used as set point. It is possible to adjust the tension set point, by using the following procedure:

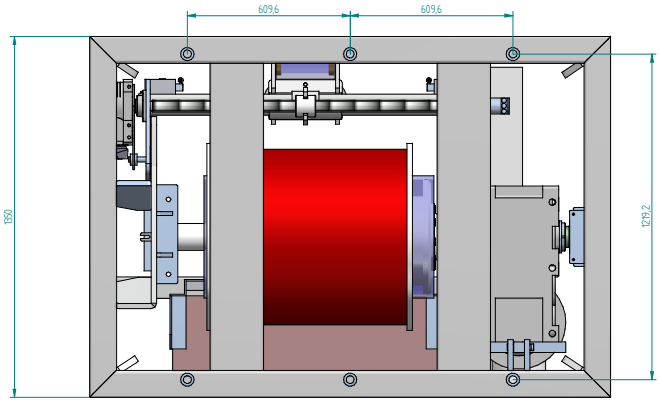
For more details see section 5.2.2.

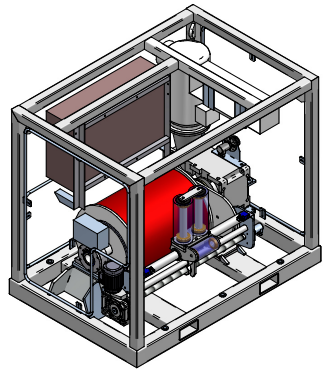
Note: This function can only be activated when the cable length value in the display is above 30 m.

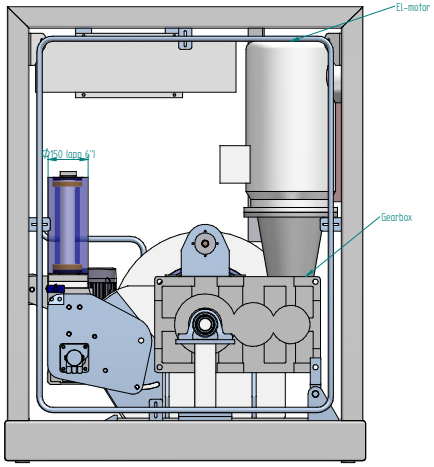
6 Section - Mechanical Drawings

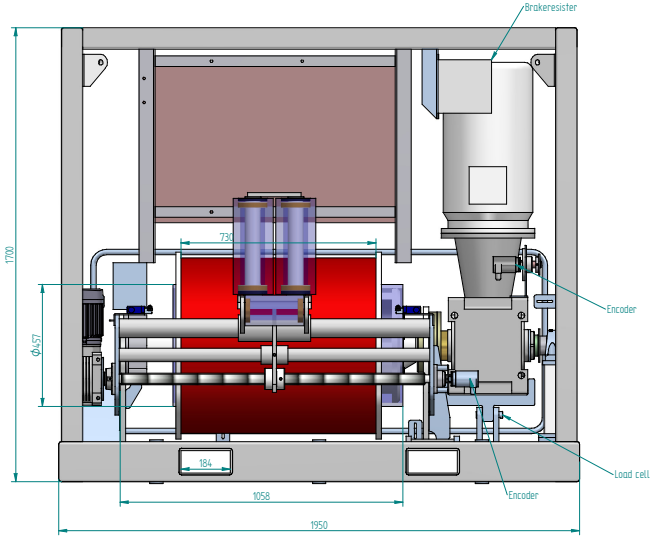
When the Levelwind is in this position then its easier to take out the drum.

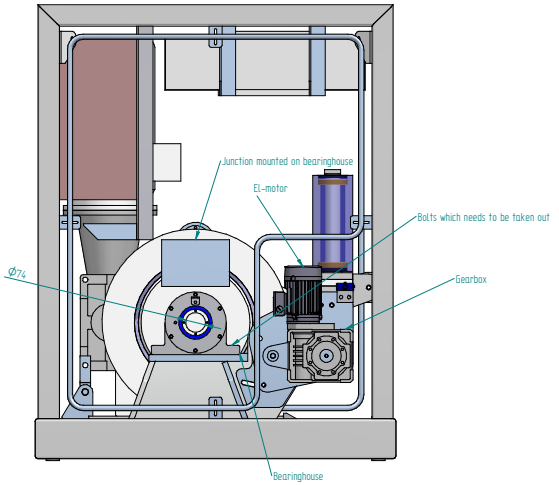


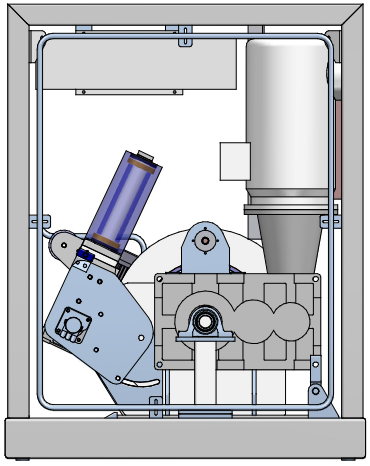


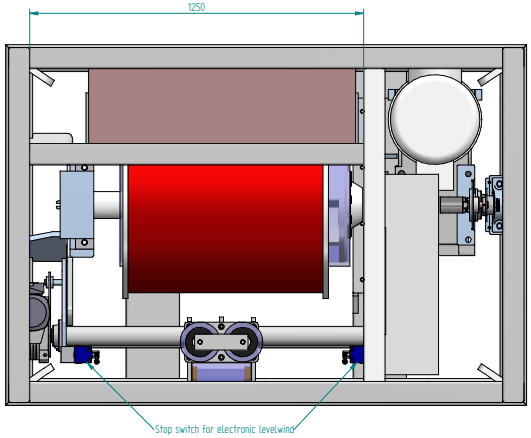












To desassemble the drum the bolts for the bearinghouse needs to be taken out. The bolts in the Levelwind needs to be loosened

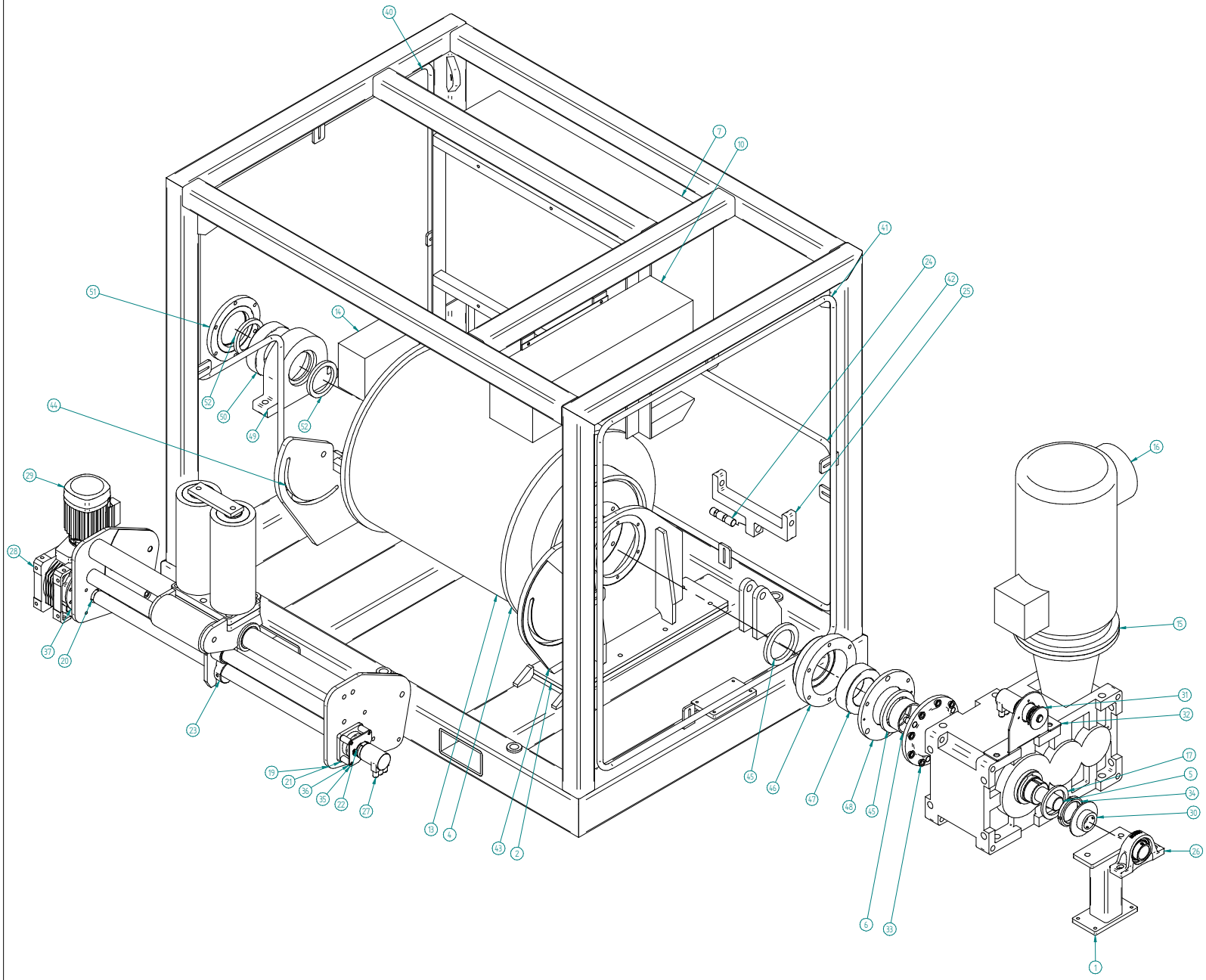
–	–	–	–	Material:		Weight:	2453 kg
–	–	–	–	Measurements without tolerances acc. to DS/ISO 2768-1 m		File no:	–
–	–	–	–			App.	
Revision		Date	Name	Path: –		Date	Name

Unauthorize use of this drawing, which may not be copied, is subjected to prosecution according to the law of illoyal competition

Customer: WH01	Subject: Winch2000-8,18-10,6

MacArtney UNDERWATER TECHNOLOGY — SH GROUP AS Hydraulic · Steel · Engineering

Scala: 1:10	Date: 18-03-10
Drawn by.: TS	Ordre no: 11151-35479
Format: A1	Drawing no: 35479-0



Item no	Subject	Material	Weight	Drawing no	Raw-material	Quantity
1	Frame	S 355	485 kg	35479-0-10		1
2	Side1	S 355	87 kg	35479-0-13		1
4	Drum	ST52-3	227 kg	35479-0-11		1
5	Main shaft					1
6	Washer	AISI304				1
7	El-Box	RF	144 kg			1
8*	Fork	AISI304	0 kg	34494-0-114		1
9*	Stopkontakt	AISI304	1 kg	34494-0-110		2
10	Brakeresistor		8 kg			1
11*	Stopswitch_Right		1 kg	33534-0-91		1
12*	Stopswitch_Left		1 kg	33534-0-90		1
13	Umbilical	ø10mm	532 kg			1
14	Junctionbox_1					1
15	RXV2808C1164_4PAMG1EC160B5M1		250 kg			1
16	160 M B5-Bremse		182 kg			1
17	Skive		0 kg	35479-0-109		1
19	Levelwind		200 kg	35479-0-15		1
20	FY 35					1
21	FY30FM					1
22	Threadspindle	S355	15 kg	35479-0-103		1
23	Nut	ST52-3	2 kg			1
24	Load pin					1
25	Gaffel for load pin	S355	6 kg	35479-0-105		1
26	SY 50					1
27	Encoder – PSM 581	AISI316	2 kg			1
28	w86u-p80b14		37 kg			1
29	K21r_80_G4-3D					1
30	Chain wheel 06B Z40	AISI304	1 kg	482105		1
31	Encoder – PSM 581	AISI304	2 kg	Enc. kompl.-482080		1
32	Plate for encoder					1
33	Nordlock					9
34	KM_6_PART1					1
35	Plade for encoder	AISI 304	0 kg	35479-0-108		1
36	Bøs for encoder	AISI 304	0 kg	35479-0-104		3
37	Momentarm					1
38*	Skive2					1
39*	Skive for gear	S355	0 kg	35479-0-110		1
40	Saftygrid	S355	12 kg	3		1
41	Saftygrid	S355	12 kg	35479-0-107		1
42	Saftygrid	S355	11 kg	2		1
43	Wearing plate					1
44	Wearing plate_3					1
45	CB100-150-13	Gummi	0 kg			2
46	Bearinghousing	ST52-3	11 kg	35479-0-102		1
47	Bearing23120		5 kg			1
48	Cover100-220	S 355	4 kg	35479-0-102		1
49	Bearing house	S355G3	16 kg	35479-0-16-100		1
50	Bearing23024	Steel	4 kg			1
51	Cover200-400	S355J2G3	4 kg	35479-0-16-100		1
52	SM120-150-12	Rubber	0 kg			2

–	–	–	–	Material:	Weight: 2453 kg
–	–	–	–	Messurements without tolerances acc. to DS/ISO 2768-1 m	File no: –
0	–	–	–		App.
Revision		Date	Name	Path: –	Date / Name

Unauthorize use of this drawing, wich may not be copied, is subjected to prosecution according to the law of illoyal competition

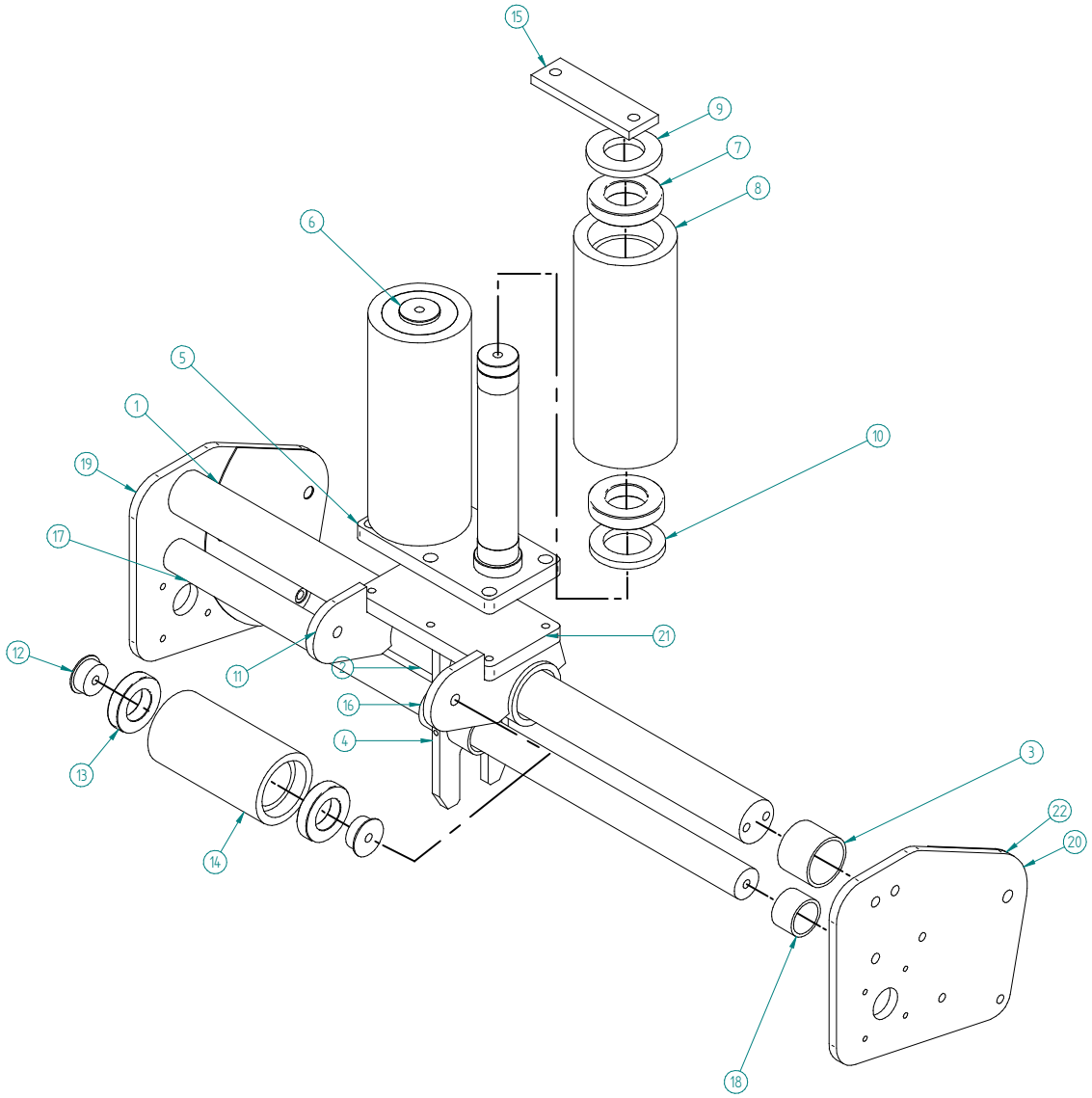
Costumer: WH01

Subject: Winch2000-8,18-10,6

MacArtney UNDERWATER TECHNOLOGY

SH GROUP AS Hydraulic · Steel · Engineering

Scala: 1:10	Date: 06-10-11
Drawn by.: TS	Ordre no: 11151-35479
Format: A1	Drawing no: 35479-0-EXP



Item no	Subject	Material	Weight	Drawing no	Raw-material	Quantity
1	Shaft ø70	Centerless	35 kg			1
2	Leading pipe	ST52-3	7 kg			1
3	Bush70-80-60	Oliebronze	1 kg			2
4	Gaffel1	ST52-3	3 kg			1
5	Hole plate	ST52-3	6 kg			1
6	shaft ø60	ST52-3	17 kg			2
7	6212-2RS		5 kg			4
8	Roll ø117	ST52-3	58 kg			2
9	CB60-110-12	Gummi	0 kg			2
10	CB70-110-12	Gummi	0 kg			2
11	Fork2	ST52-3	4 kg			2
12	Bearing shaft	ST52-3	1 kg			2
13	6210-2RS1	RF	1 kg			2
14	Roll⌀108	ST52-3	10 kg			1
15	Top plate	ST52-3				1
16	Bush	ST52-3				1
17	Shaft ø50	ST52-3	18 kg			1
18	Bush50-60-40	Messing				2
19	Doubling1	S355J2G3	13 kg			1
20	Doubling1	S355J2G3	13 kg			1
21	Hole plate	ST52-3	8 kg			1
22	Wearing plate	AISI 304				2
23*	Axel for moment					1

-	-	-	-	Material:	Weight: 200 kg
-	-	-	-	Messurements without tolerances acc. to DS/ISO 2768-1 m	File no: -
0	-	-	-		App.
Revision		Date	Name	Path: -	Date / Name

Unauthorize use of this drawing, wich may not be copied, is subjected to prosecution according to the law of illoyal competition

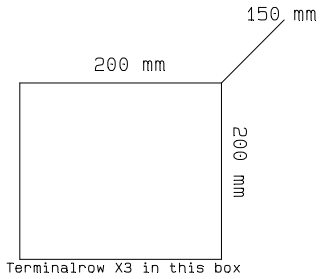
Costumer: WH01

Subject: Levelwind

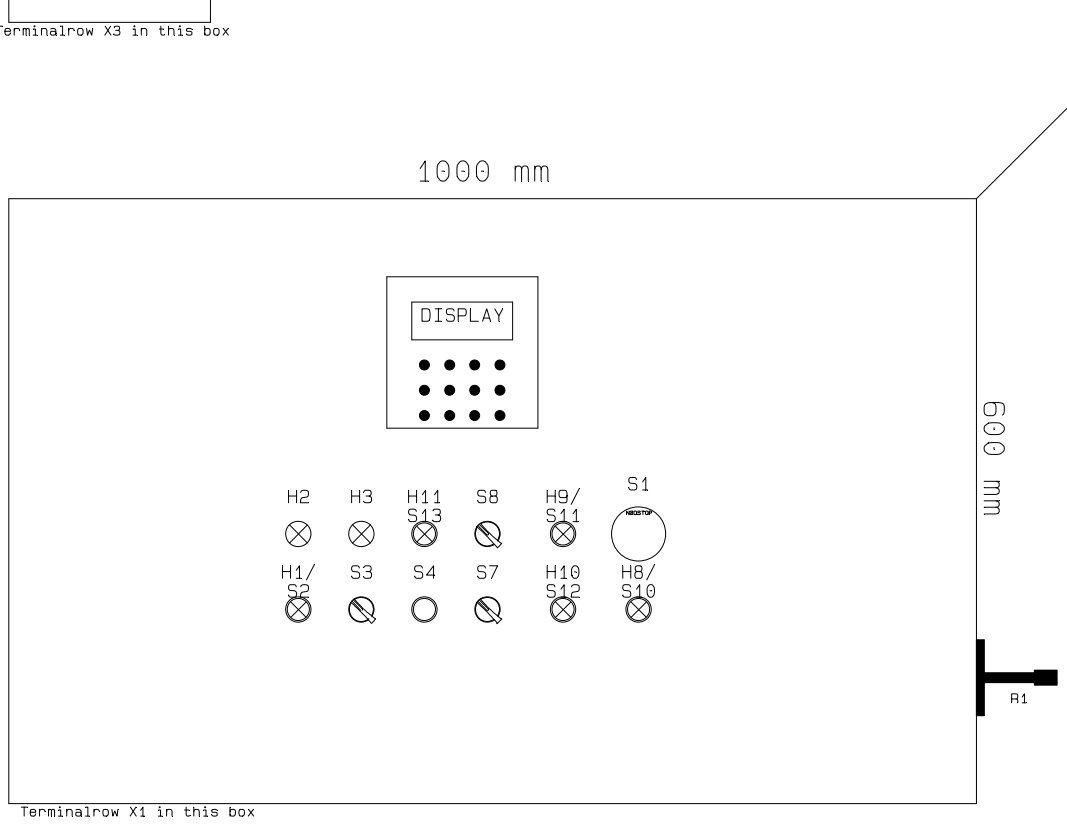
MacArtney UNDERWATER TECHNOLOGY SH GROUP AS Hydraulic · Steel · Engineering

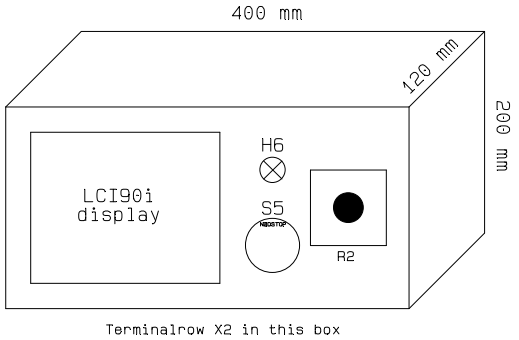
Scala: -	Date: 06-10-11
Drawn by.: TS	Ordre no: 11151-35479
Format: A3	Drawing no: 35479-0-15 EXP

7 Section - Electrical Drawings



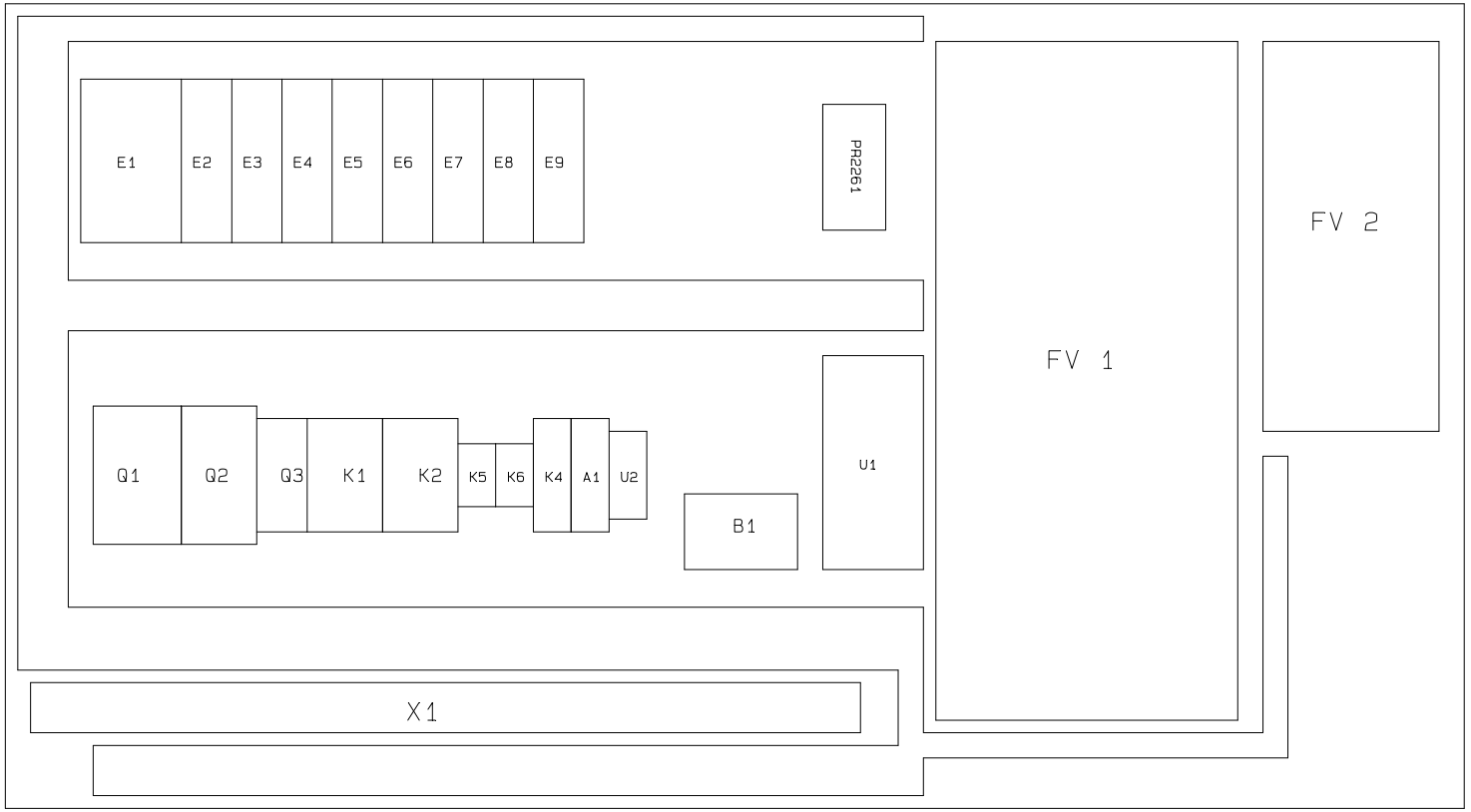
S1: EM.STOP
S2: START/STOP
S3: LOCAL/REMOTE
S4: ZERO WIRELENGHT
S5: EM.STOP
S7: LEVELWIND AUTO / MAN
S8: LEVELWIND LEFT - 0 - RIGHT
S10: RESET EM. STOP
S11: CONSTANT TENSION
S12: START/STOP AHC
S13: AUTO RENDERING ACK
H1: RUNNING LIGHT
H2: LOCAL CONTROL
H3: REMOTE CONTROL
H6: REMOTE CONTROL
H8: EM. STOP ACTIV
H9: TENSION MODE ON
H10: AHC ACTIVE
H11: AUTO RENDERING ACTIVE
R1: JOYSTICK
R2: JOYSTICK





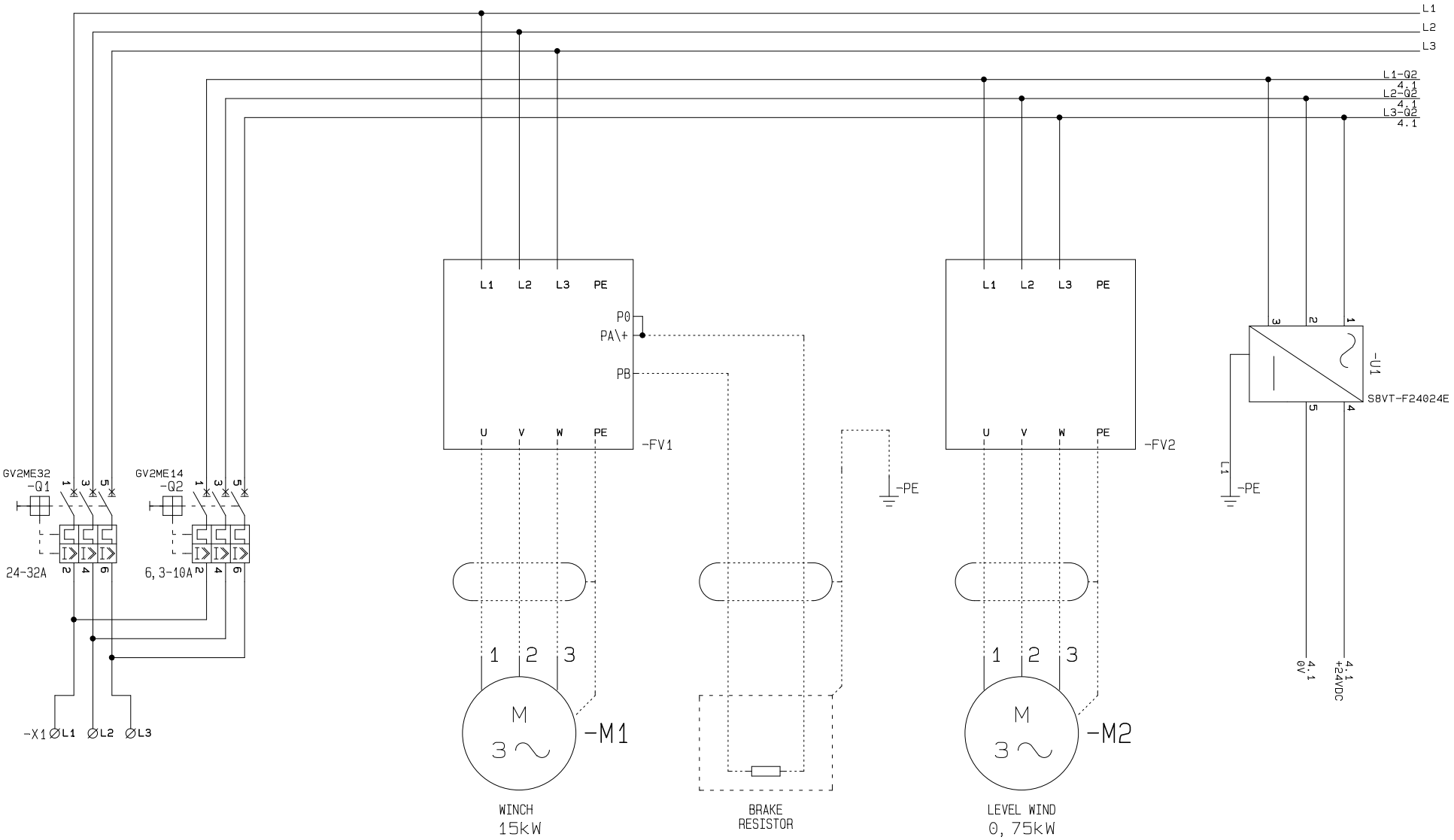
ASME A/S
A. Schmidt's Marine-EL A/S
Idumvej 6, Bur
DK-7570 Vemb
Phone: +45 96 93 50 50
Fax: +45 96 93 50 51

Customer: MacArtney		Konstr.: MH	Sags nr: 10363-34494
Project title: MASH winch 2000-10-15kN		Check.:	Rev.: 11/10-2010 MDH
Drawing: Layout		Last plot: 24-10-2011 08:58:18	
Drawing no:		Last change: 08-07-2011 15:14:16	Sheet: 1 of 23



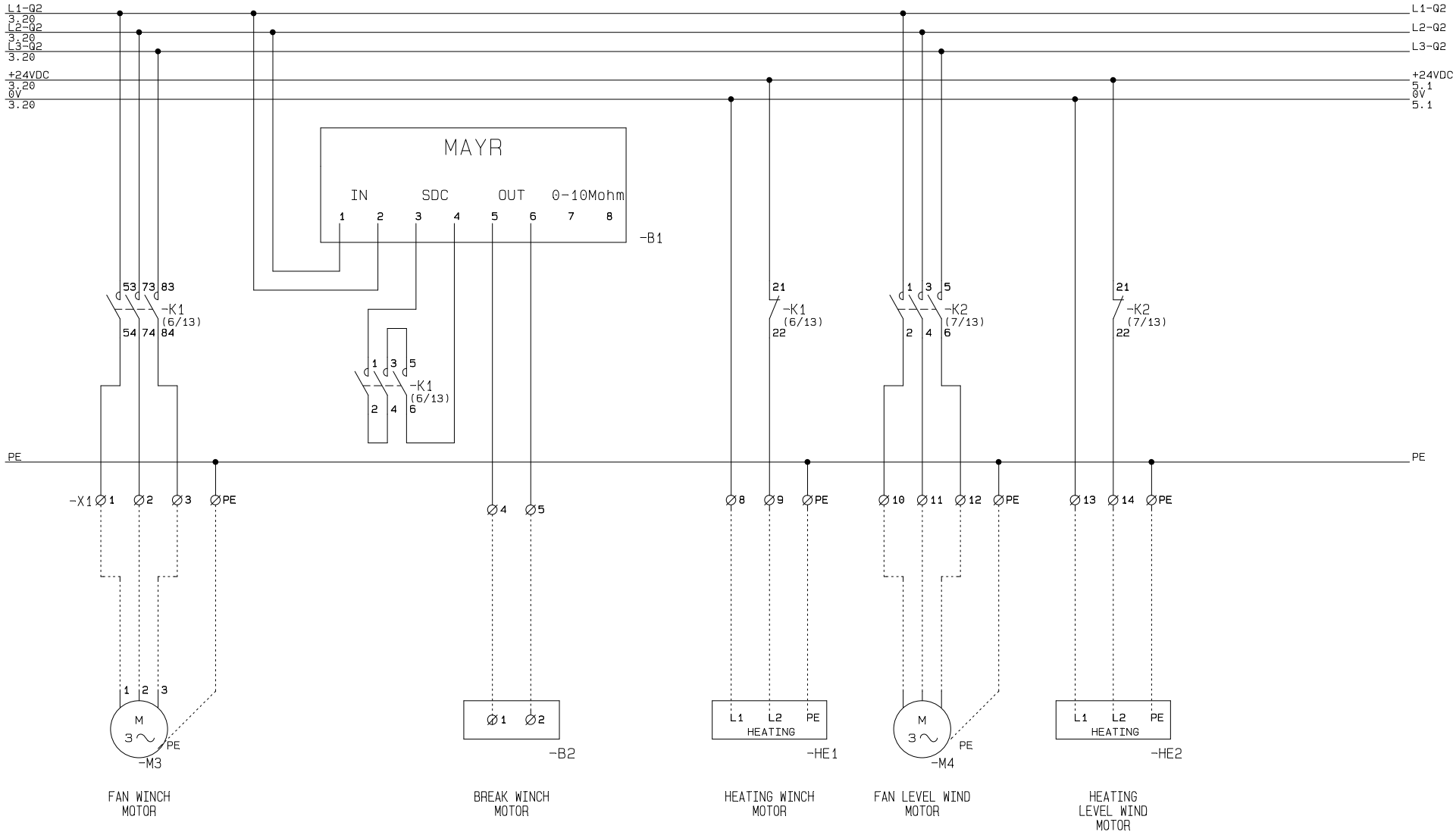
ASME A/S
A. Schmidt's Marine-EL A/S
Idumvej 6, Bur
DK-7570 Vemb
Phone: +45 96 93 50 50
Fax: +45 96 93 50 51

Customer: MacArtney	Konstr.: MH	Sags nr: 10363-34494
Project title: MASH winch 2000-10-15kN	Check.:	Rev.: 11/10-2010 MDH
Drawing: Layout inside box	Last plot: 24-10-2011 08:58:18	
Drawing no:	Last change: 02-06-2011 07:30:34	Sheet: 2 of 23



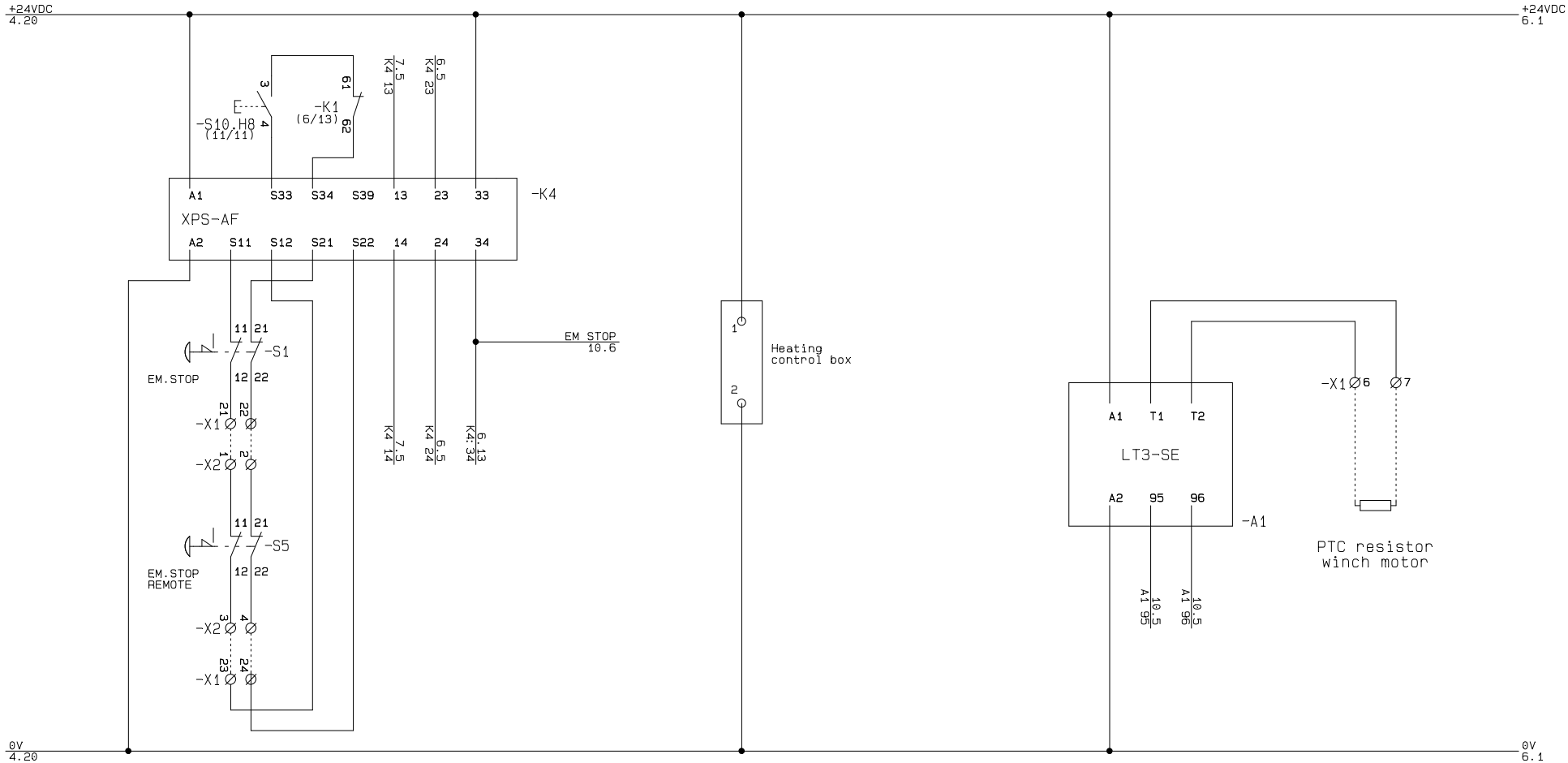
ASME A/S
A. Schmidt's Marine-EL A/S
Idumvej 6, Bur
DK-7570 Vemb
Phone: +45 96 93 50 50
Fax: +45 96 93 50 51

Customer: MacArtney		Konstr.: MH	Sags nr: 10363-34494
Project title: MASH winch 2000-10-15kN		Check.:	Rev.: 11/10-2010 MDH
Drawing: MAIN VOLTAGE		Last plot: 24-10-2011 08:58:18	
Drawing no:		Last change: 22-02-2011 14:35:08	Sheet: 3 of 23



ASME A/S
A. Schmidt's Marine-EL A/S
Idumvej 6, Bur
DK-7570 Vemb
Phone: +45 96 93 50 50
Fax: +45 96 93 50 51

Customer: MacArtney		Konstr.: MH	Sags nr: 10363-34494
Project title: MASH winch 2000-10-15kN		Check.:	Rev.: 11/10-2010 MDH
Drawing: MAIN VOLTAGE		Last plot: 24-10-2011 08:58:18	
Drawing no:		Last change: 22-02-2011 14:34:50	Sheet: 4 of 23



ASME A/S
A. Schmidt's Marine-EL A/S
Idumvej 6, Bur
DK-7570 Vemb
Phone: +45 96 93 50 50
Fax: +45 96 93 50 51

Customer: MacArtney		Konstr.: MH	Sags nr: 10363-34494
Project title: MASH winch 2000-10-15kN		Check.:	Rev.: 11/10-2010 MDH
Drawing: CONTROL VOLTAGE		Last plot: 24-10-2011 08:58:18	
Drawing no:		Last change: 09-05-2011 12:54:16	Sheet: 5 of 23

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

+24VDC
5.18

+24VDC
7.1

K4:34
5.6,7.13

ATV71

LI1 LI3 24VDC PWR 0V AI1- COM AI1 AI2 AO1 R1A R2A R1C R2C

FV1

K4 24
5.6

K4 23
5.6

-K8
(11/8)
11
14

-K9
(11/9)
11
14

FV1 COM
12.10

FV1 AI1+
13.1

FV1:AI2
13.5

FV1 AO1
12.9

VW3A3401

0Vs +Vs B B A A

FV1.1

BLUE RED WITHE GREEN BLACK YELLOW

Motor encoder

A1 A1 LC1D09BD
-K1
A2 A2

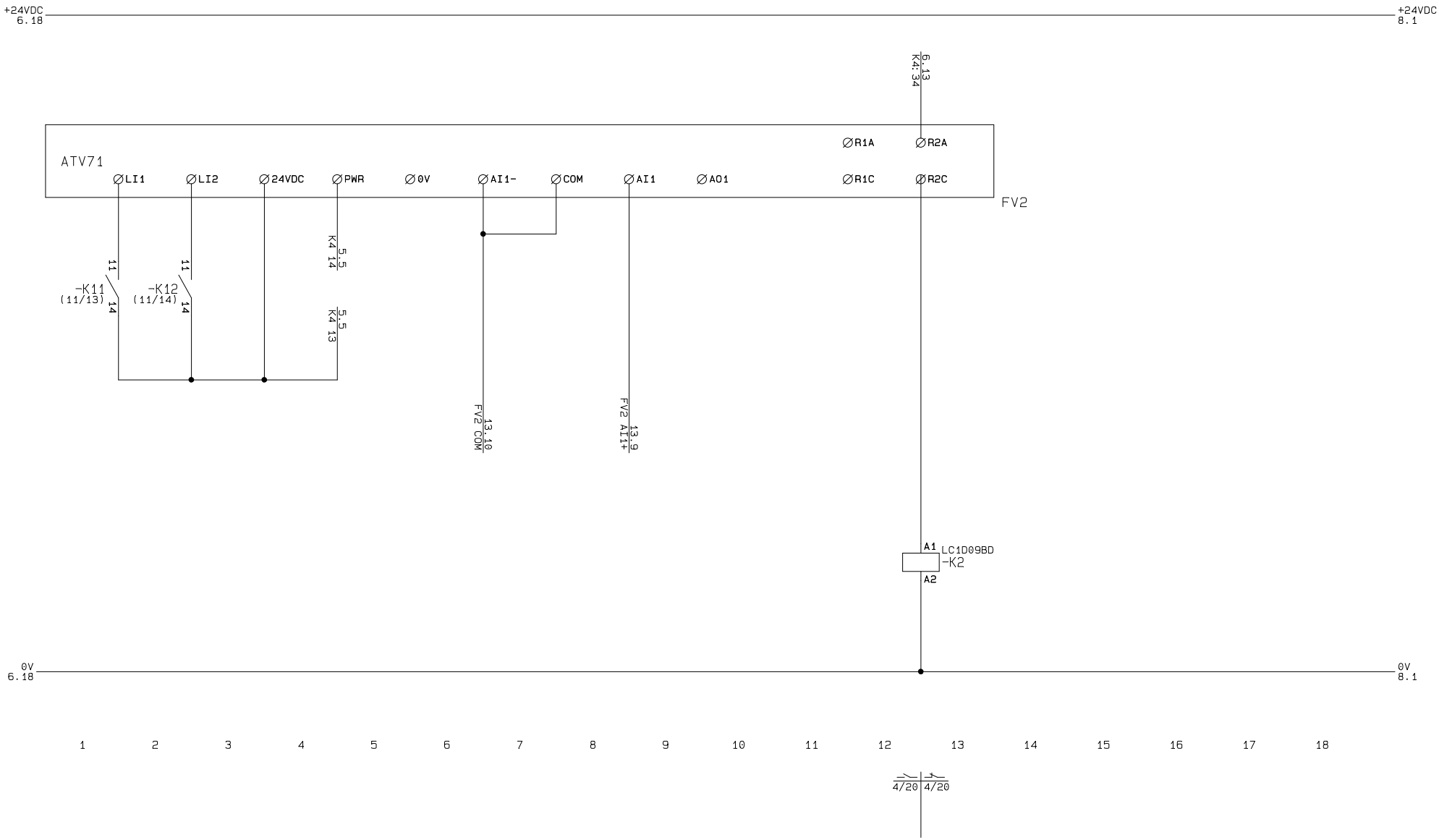
0V
5.18

0V
7.1

4/4 4/20
4/10 5/5

ASME A/S
A. Schmidt's Marine-EL A/S
Idumvej 6, Bur
DK-7570 Vemb
Phone: +45 96 93 50 50
Fax: +45 96 93 50 51

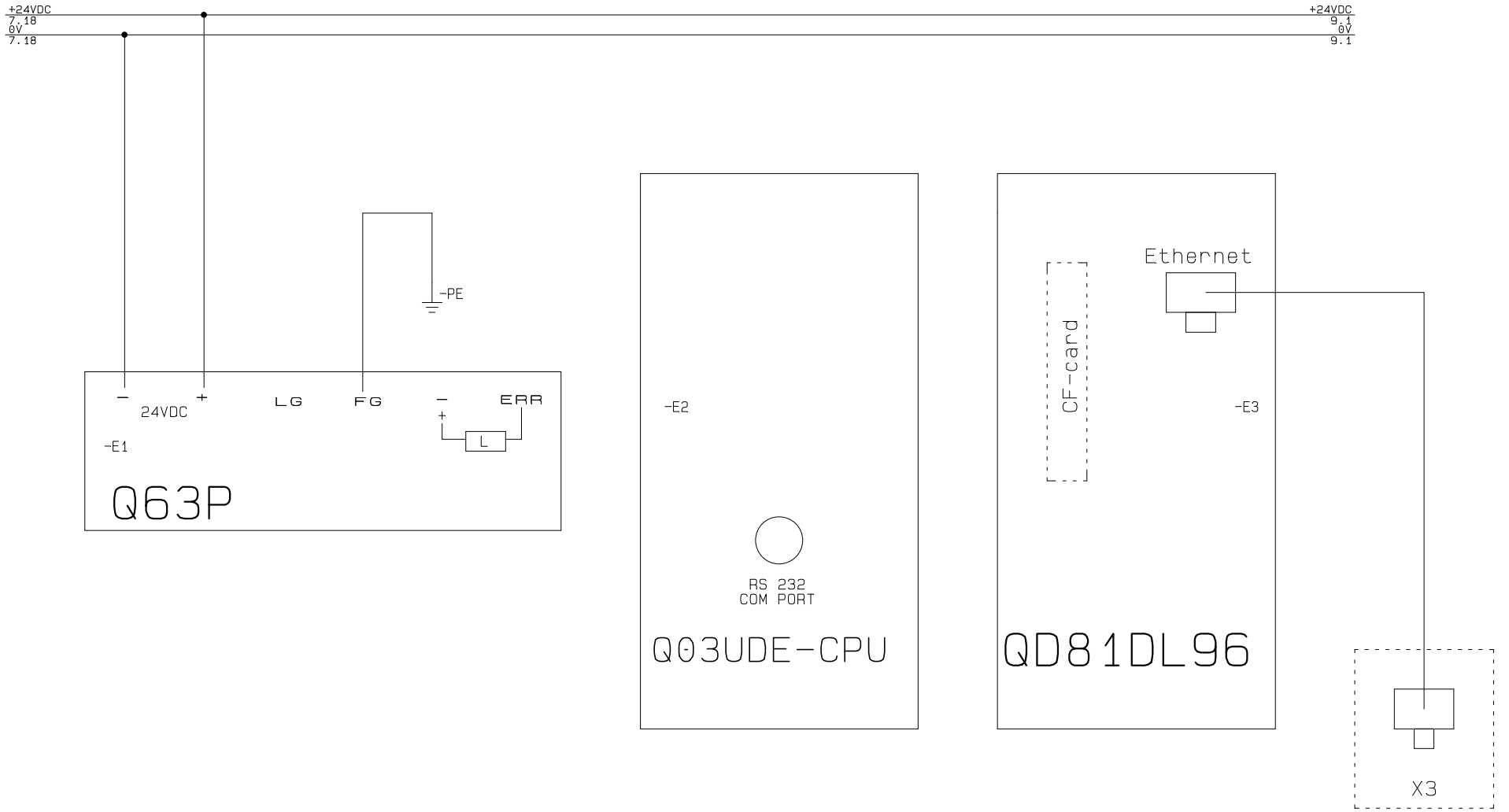
Customer: MacArtney	Konstr.: MH	Sags nr: 10363-34494
Project title: MASH winch 2000-10-15kN	Check.:	Rev.: 11/10-2010 MDH
Drawing: Control voltage	Last plot: 24-10-2011 08:58:18	
Drawing no:	Last change: 02-06-2011 07:22:30	Sheet: 6 of 23



ASME A/S
A. Schmidt's Marine-EL A/S
Idumvej 6, Bur
DK-7570 Vemb
Phone: +45 96 93 50 50
Fax: +45 96 93 50 51

Customer: MacArtney	Konstr.: MH	Sags nr: 10363-34494
Project title: MASH winch 2000-10-15kN	Check.:	Rev.: 11/10-2010 MDH
Drawing: CONTROL VOLTAGE	Last plot: 24-10-2011 08:58:18	
Drawing no:	Last change: 09-05-2011 14:21:10	Sheet: 7 of 23

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18



ASME A/S
A. Schmidt's Marine-EL A/S
Idumvej 6, Bur
DK-7570 Vemb
Phone: +45 96 93 50 50
Fax: +45 96 93 50 51

Customer: MacArtney		Konstr.: MH	Sags nr: 10363-34494
Project title: MASH winch 2000-10-15kN		Check.:	Rev.:
Drawing:		Last plot: 24-10-2011 08:58:18	
Drawing no:		Last change: 08-07-2011 15:22:48	Sheet: 8 of 23

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

+24VDC
8.18
0V
8.18

+24VDC
10.1
0V
10.1

-X1 19 20

-E4

B
A
B
A

9 4 8 3 7 2 6 1 5

QJ71PB92V

Winch Adr. no.1
Encoder drum

Pepperl & Fuchs

+ - B A B A

-A2

Level wind Adr. no.2
Encoder level wind

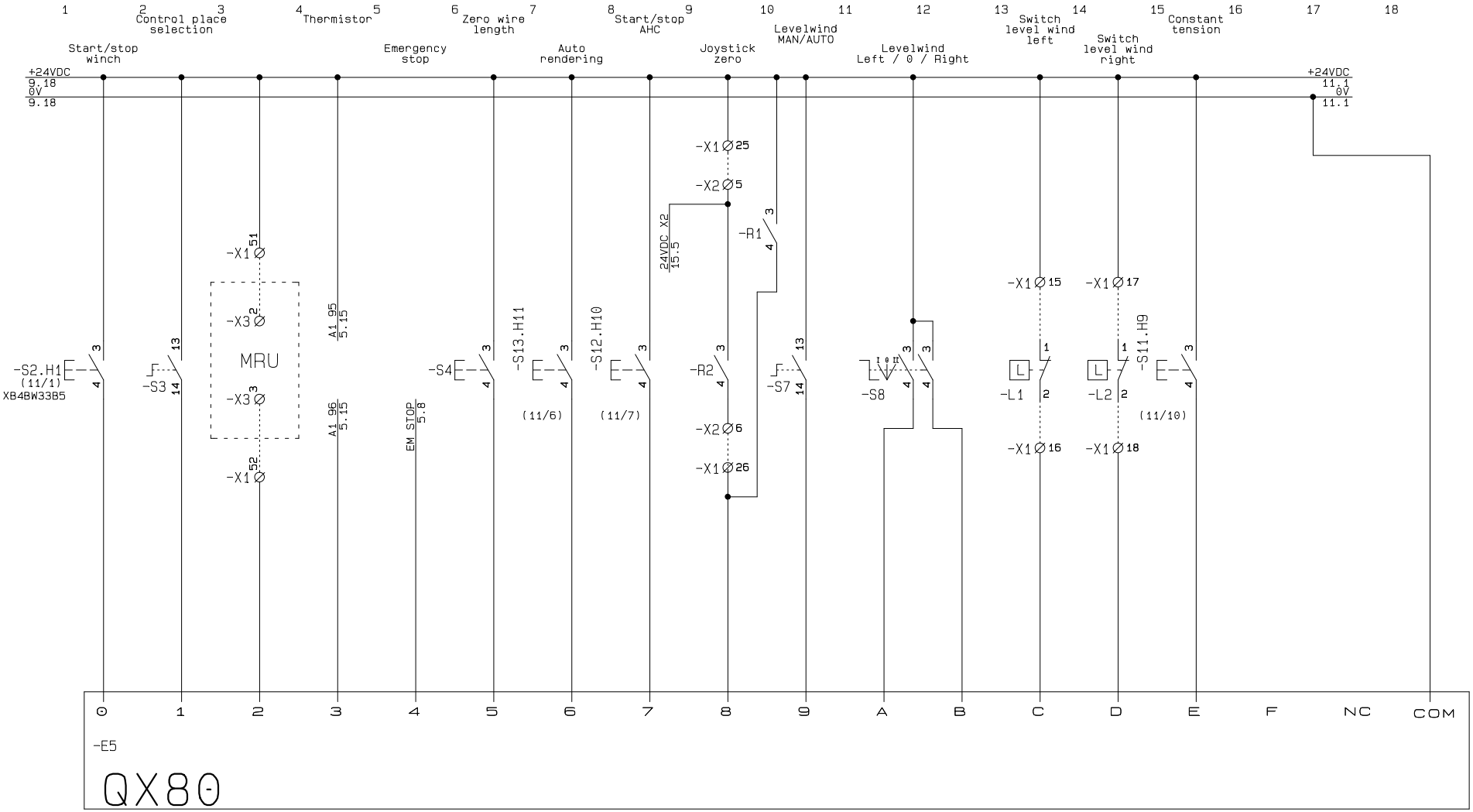
Pepperl & Fuchs

+ - B A B A

-A3

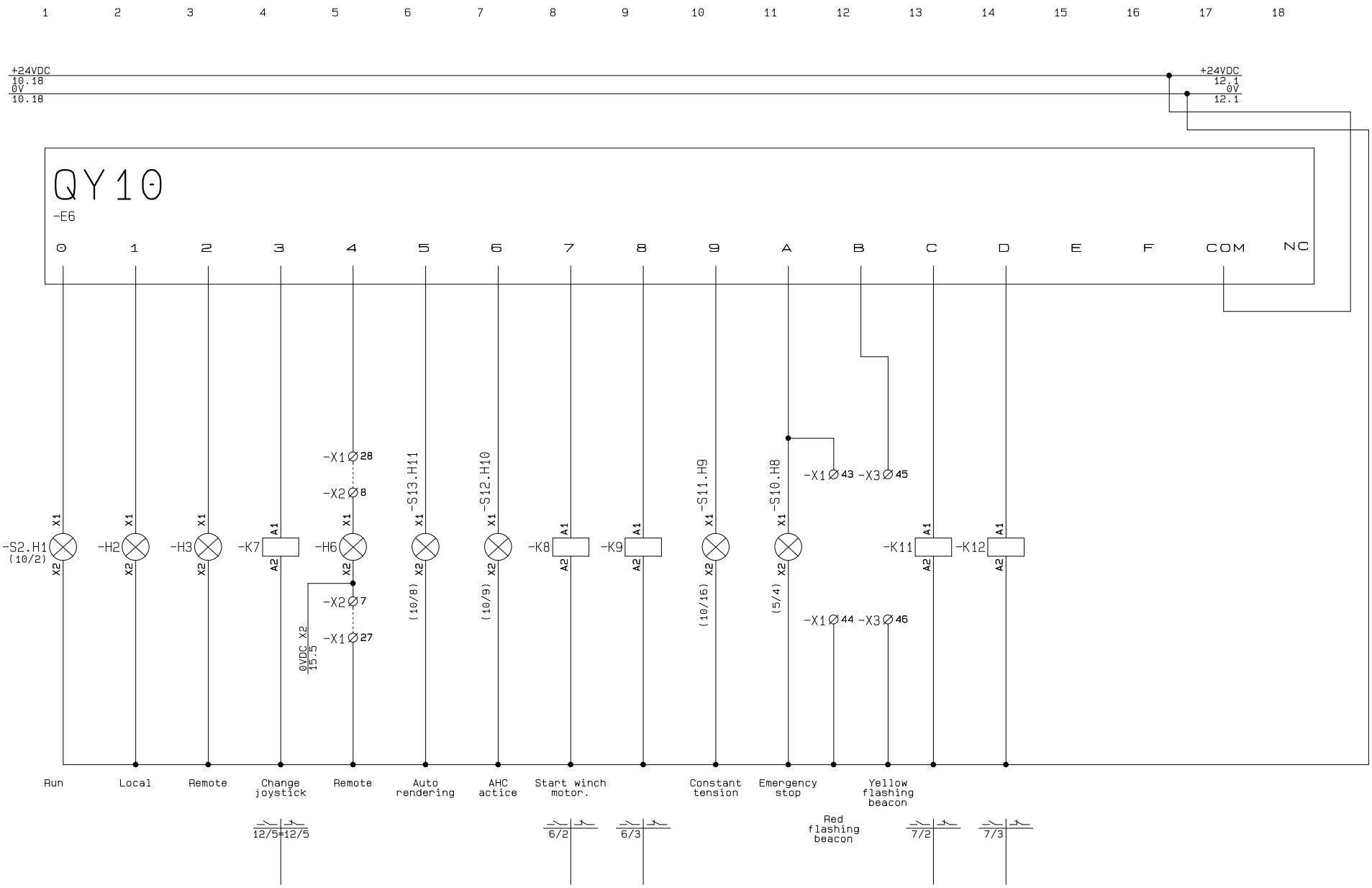
ASME A/S
A. Schmidt's Marine-EL A/S
Idumvej 6, Bur
DK-7570 Vemb
Phone: +45 96 93 50 50
Fax: +45 96 93 50 51

Customer: MacArtney		Konstr.: MH	Sags nr: 10363-34494
Project title: MASH winch 2000-10-15kN		Check.:	Rev.:
Drawing:		Last plot: 24-10-2011 08:58:18	
Drawing no:		Last change: 09-05-2011 12:54:22	Sheet: 9 of 23



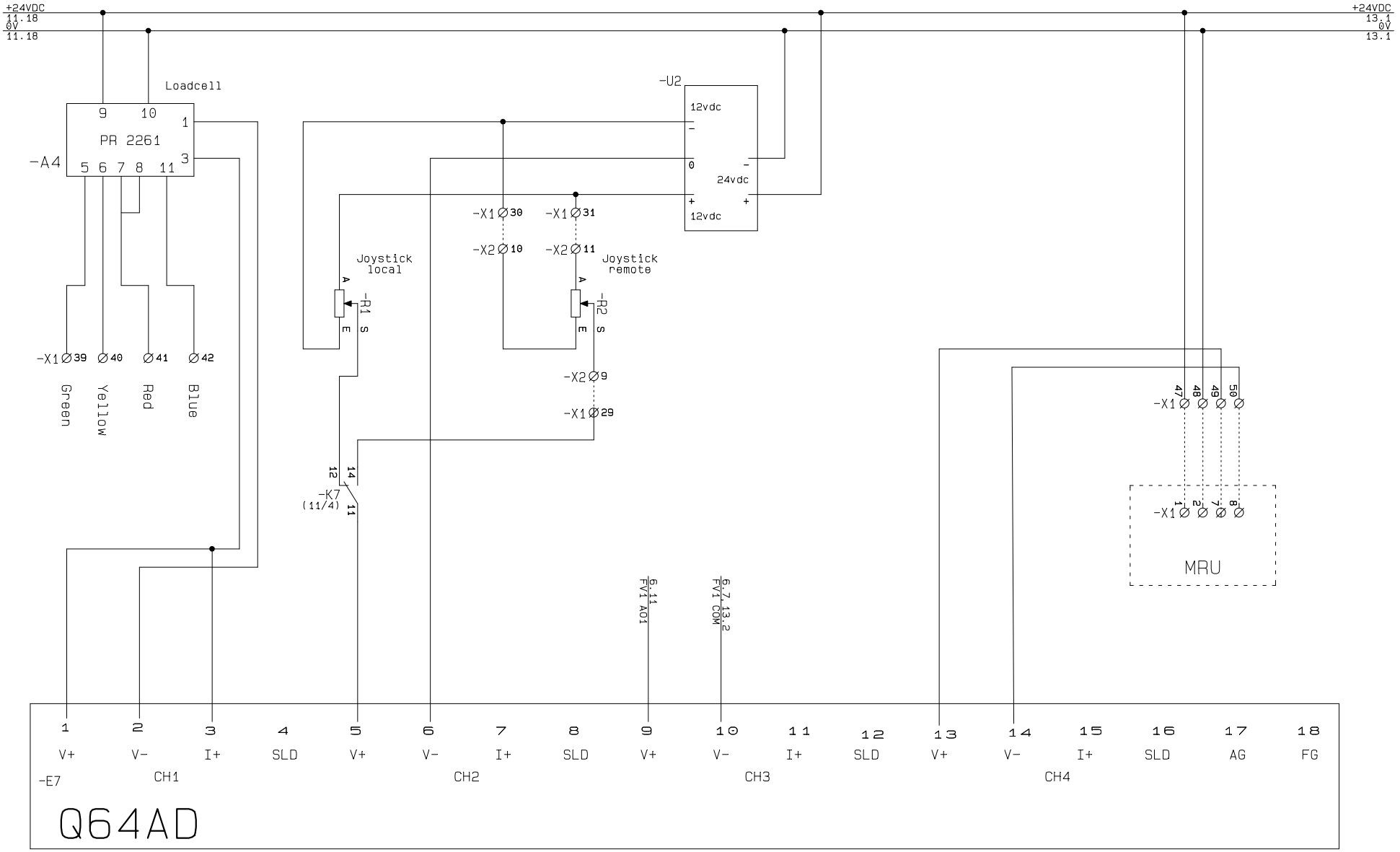
ASME A/S
A. Schmidt's Marine-EL A/S
Idumvej 6, Bur
DK-7570 Vemb
Phone: +45 96 93 50 50
Fax: +45 96 93 50 51

Customer: MacArtney		Konstr.: MH	Sags nr: 10363-34494
Project title: MASH winch 2000-10-15kN		Check.:	Rev.:
Drawing:		Last plot: 24-10-2011 08:58:18	
Drawing no:		Last change: 06-06-2011 11:10:12	Sheet: 10 of 23



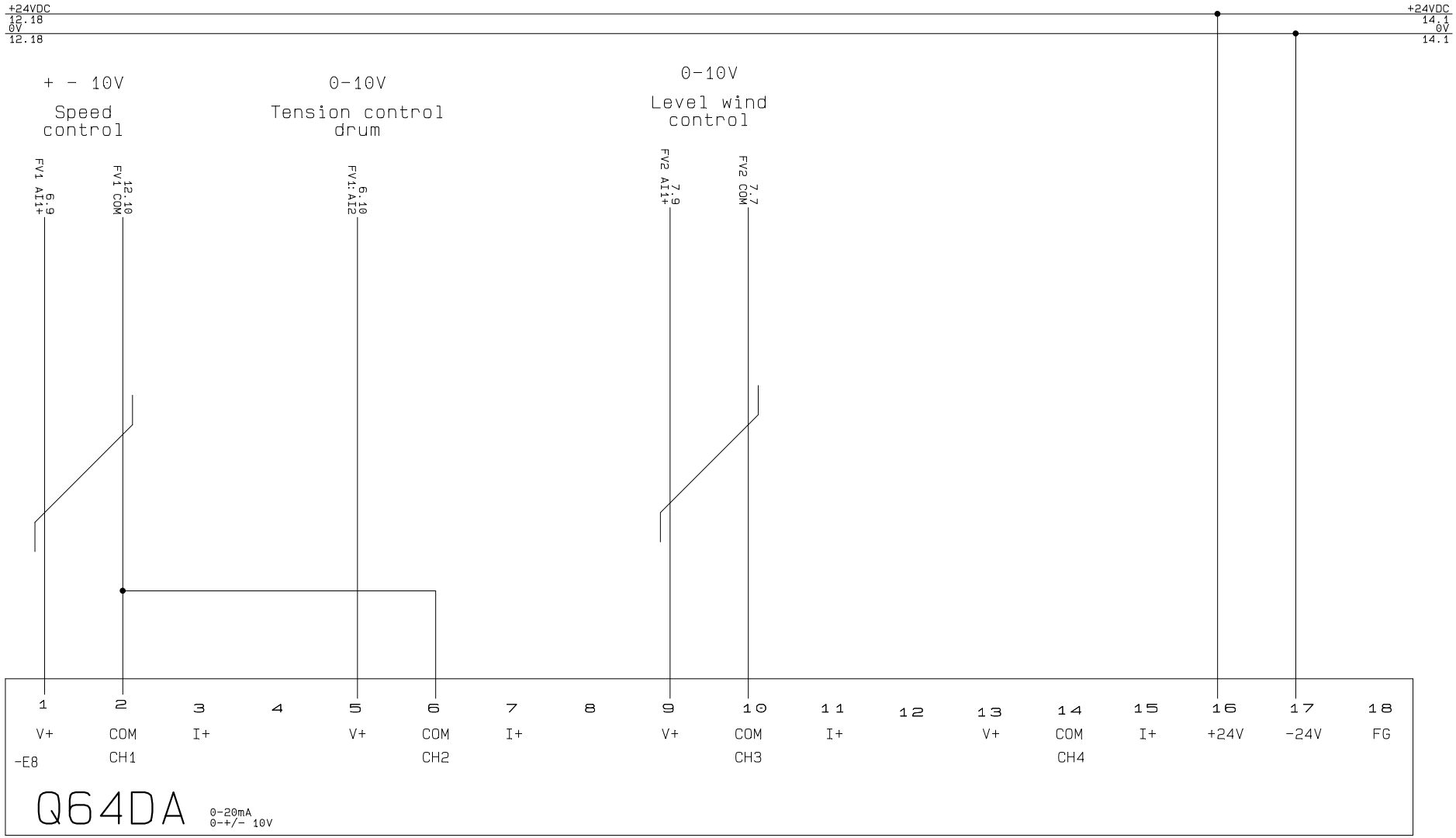
ASME A/S
A. Schmidt's Marine-EL A/S
Idumvej 6, Bur
DK-7570 Vemb
Phone: +45 96 93 50 50
Fax: +45 96 93 50 51

Customer: MacArtney		Konstr.: MH	Sags nr: 10363-34494
Project title: MASH winch 2000-10-15kN		Check.:	Rev.:
Drawing:		Last plot: 24-10-2011 08:58:18	
Drawing no:		Last change: 06-06-2011 11:10:12	Sheet: 11 of 23



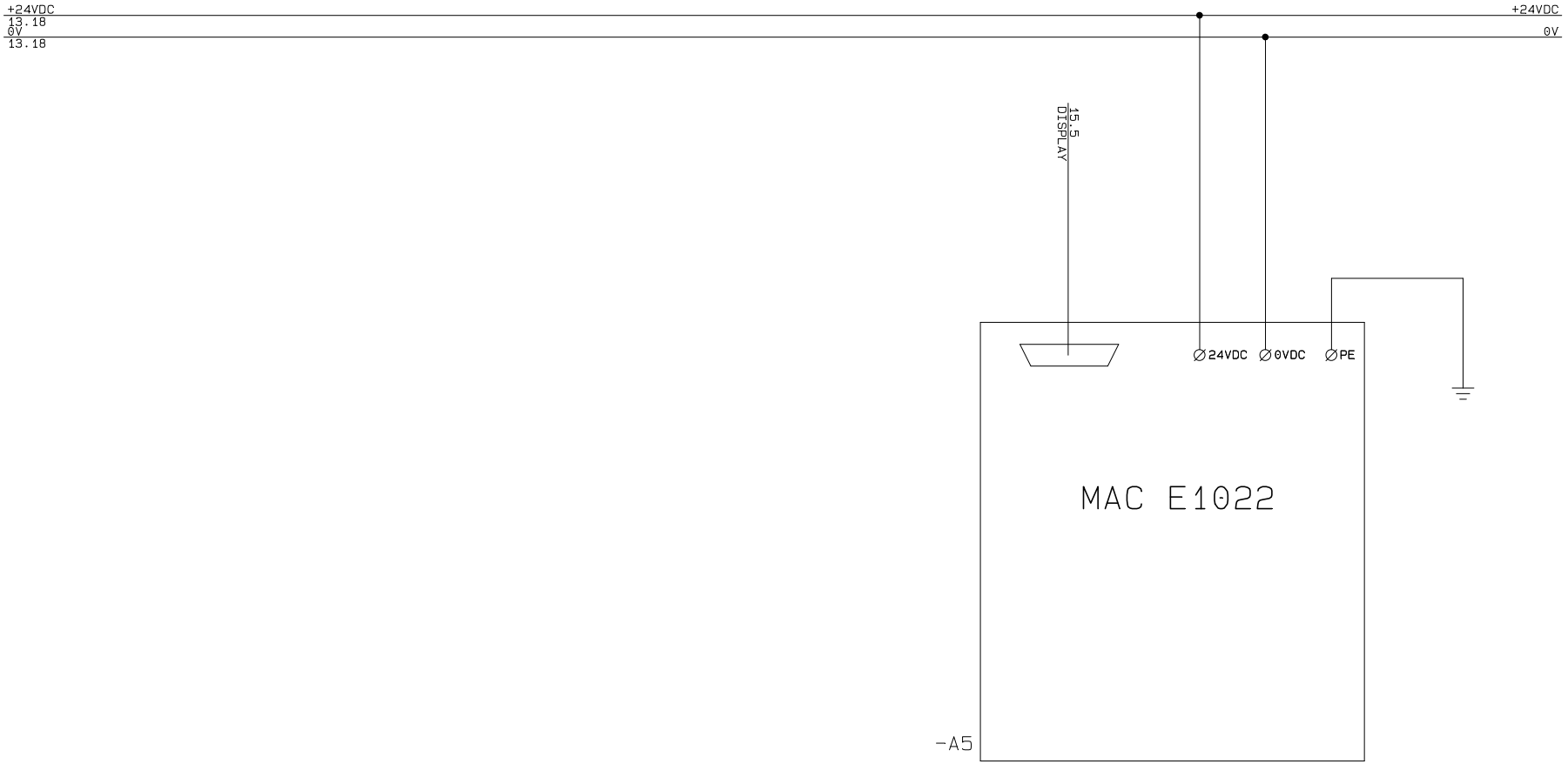
ASME A/S
A. Schmidt's Marine-EL A/S
Idumvej 6, Bur
DK-7570 Vemb
Phone: +45 96 93 50 50
Fax: +45 96 93 50 51

Customer: MacArtney		Konstr.: MH	Sags nr: 10363-34494
Project title: MASH winch 2000-10-15kN		Check.:	Rev.: 11/10-2010 MDH
Drawing: PLC digital in and out		Last plot: 24-10-2011 08:58:18	
Drawing no:		Last change: 07-06-2011 16:56:36	Sheet: 12 of 23



ASME A/S
A. Schmidt's Marine-EL A/S
Idumvej 6, Bur
DK-7570 Vemb
Phone: +45 96 93 50 50
Fax: +45 96 93 50 51

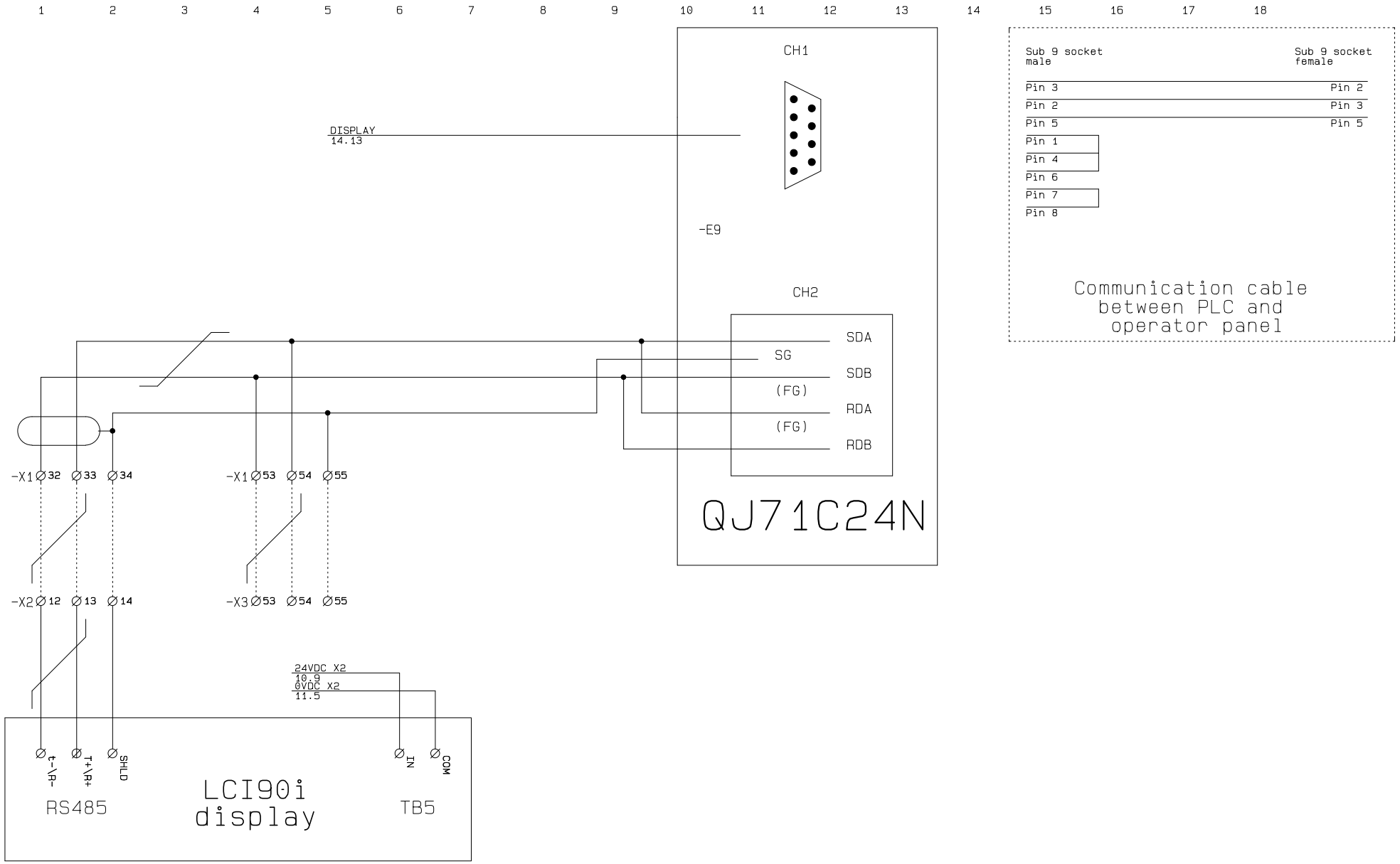
Customer: MacArtney	Konstr.: MH	Sags nr: 10363-34494
Project title: MASH winch 2000-10-15kN	Check.:	Rev.: 11/10-2010 MDH
Drawing: PLC digital in and out	Last plot: 24-10-2011 08:58:18	
Drawing no:	Last change: 09-05-2011 12:54:12	Sheet: 13 of 23



1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

ASME A/S
A. Schmidt's Marine-EL A/S
Idumvej 6, Bur
DK-7570 Vemb
Phone: +45 96 93 50 50
Fax: +45 96 93 50 51

Customer: MacArtney	Konstr.: MH	Sags nr: 10363-34494
Project title: MASH winch 2000-10-15kN	Check.:	Rev.: 11/10-2010 MDH
Drawing: Seriel communikation and display/Ethernet	Last plot: 24-10-2011 08:58:18	
Drawing no:	Last change: 06-06-2011 11:10:58	Sheet: 14 of 23

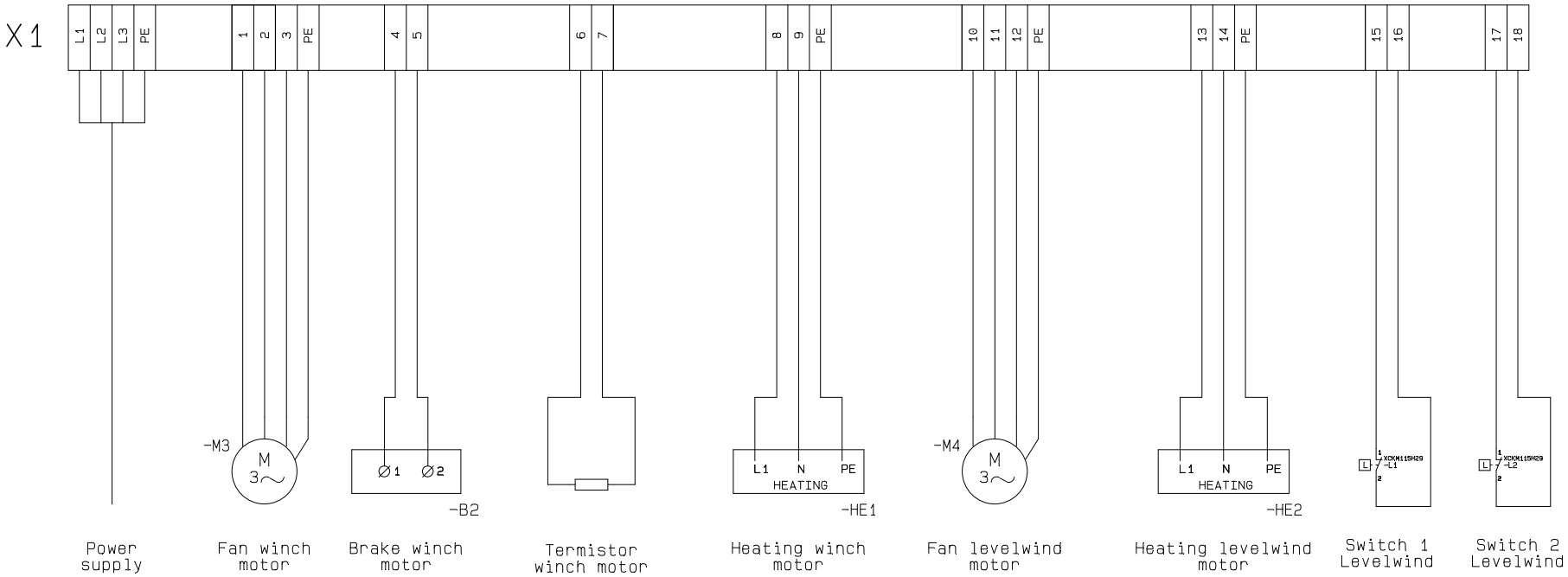


Sub 9 socket male	Sub 9 socket female
Pin 3	Pin 2
Pin 2	Pin 3
Pin 5	Pin 5
Pin 1	
Pin 4	
Pin 6	
Pin 7	
Pin 8	

Communication cable between PLC and operator panel

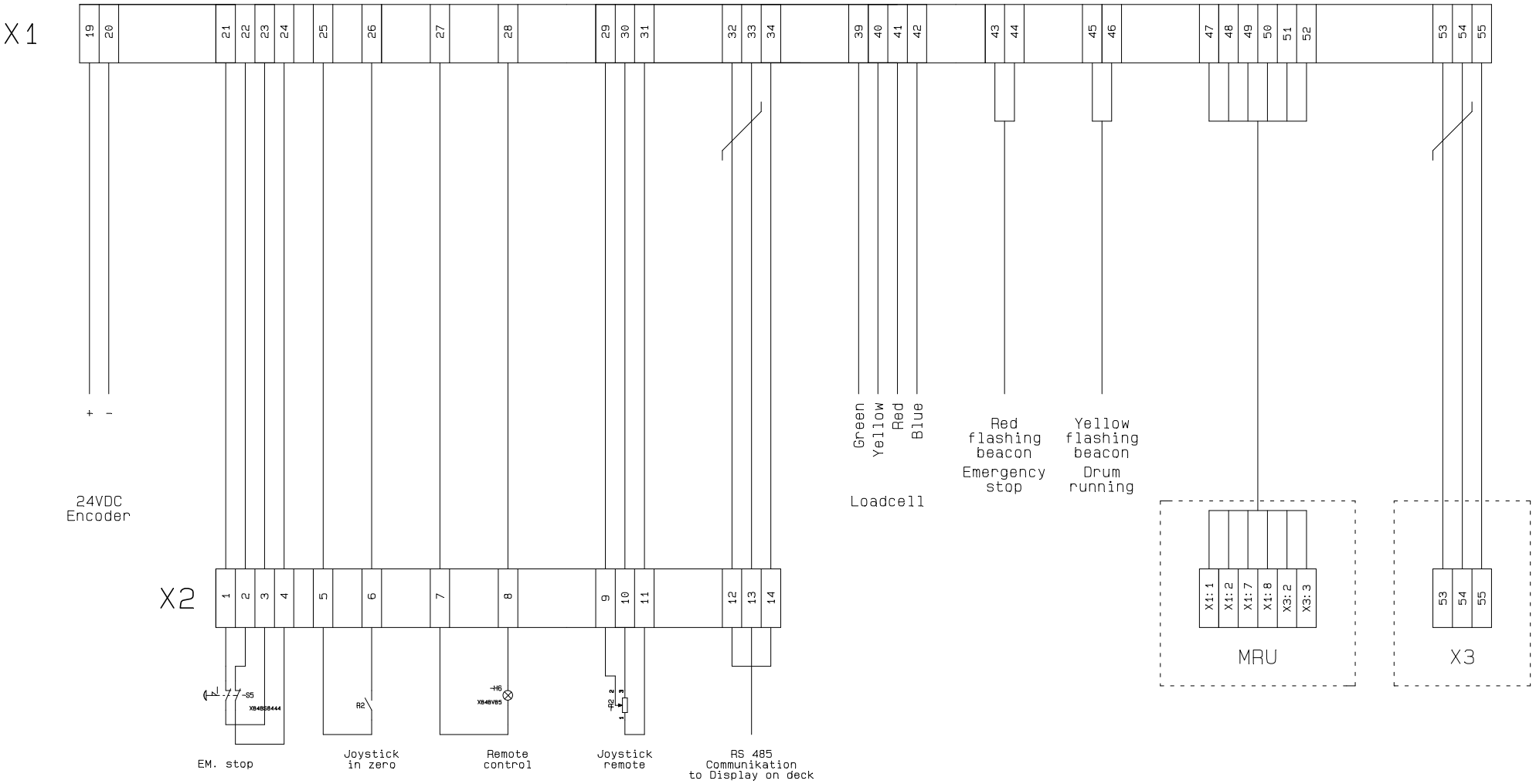
ASME A/S
A. Schmidt's Marine-EL A/S
Idumvej 6, Bur
DK-7570 Vemb
Phone: +45 96 93 50 50
Fax: +45 96 93 50 51

Customer: MacArtney	Konstr.: MH	Sags nr: 10363-34494
Project title: MASH winch 2000-10-15kN	Check.:	Rev.: 11/10-2010 MDH
Drawing: Seriel communikation/Data log 2GB	Last plot: 24-10-2011 08:58:18	
Drawing no:	Last change: 12-09-2011 15:02:48	Sheet: 15 of 23



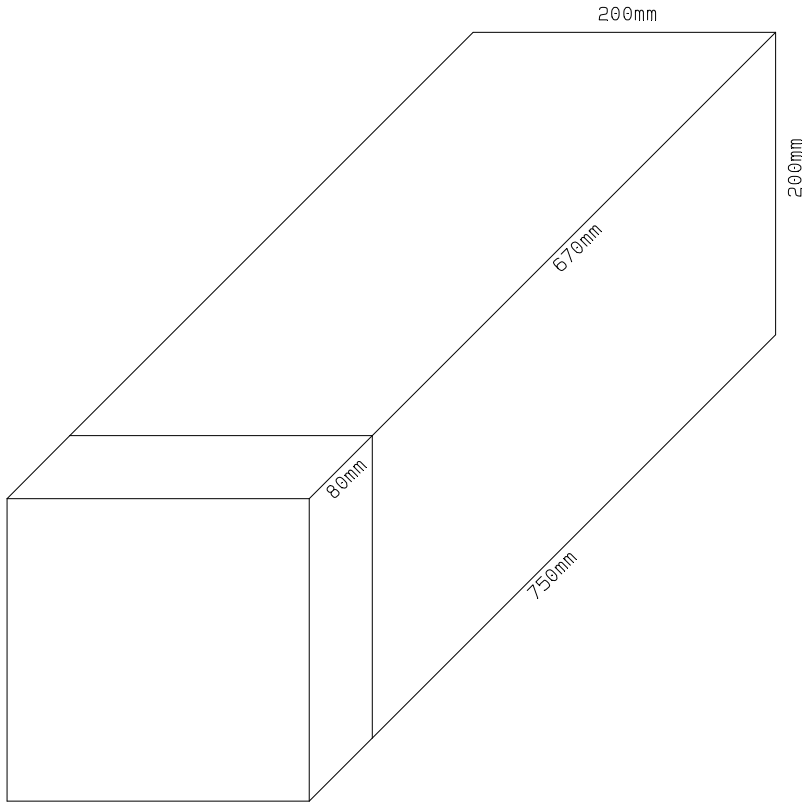
ASME A/S
A. Schmidt's Marine-EL A/S
Idumvej 6, Bur
DK-7570 Vemb
Phone: +45 96 93 50 50
Fax: +45 96 93 50 51

Customer: MacArtney		Konstr.: MH	Sags nr: 10363-34494
Project title: MASH winch 2000-10-15kN		Check.:	Rev.: 11/10-2010 MDH
Drawing: Terminal row		Last plot: 24-10-2011 08:58:18	
Drawing no:		Last change: 09-05-2011 12:54:02	Sheet: 16 of 23



ASME A/S A. Schmidt's Marine-EL A/S — Idumvej 6, Bur, DK-7570 Vemb, Phone: +45 96 93 50 50, Fax: +45 96 93 50 51	Customer: MacArtney	Konstr.: MH	Sags nr: 10363-34494
	Project title: MASH winch 2000-10-15kN	Check.:	Rev.: 11/10-2010 MDH
	Drawing: Terminal row	Last plot: 24-10-2011 08:58:18	
	Drawing no:	Last change: 08-07-2011 15:17:04	Sheet: 17 of 23

Brake resistor

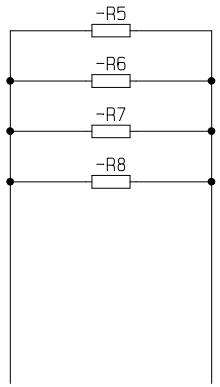


ASME A/S
A. Schmidt's Marine-EL A/S
Idumvej 6, Bur
DK-7570 Vemb
Phone: +45 96 93 50 50
Fax: +45 96 93 50 51

Customer: MacArtney	Konstr.: MH	Sags nr: 10363-34494
Project title: MASH winch 2000-10-15kN	Check.:	Rev.: 11/10-2010 MDH
Drawing: Brake resistor	Last plot: 24-10-2011 08:58:18	
Drawing no:	Last change: 09-05-2011 12:53:58	Sheet: 18 of 23

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

Brake resistor



Resistor bank
Group 1

ASME A/S
A. Schmidt's Marine-EL A/S
Idumvej 6, Bur
DK-7570 Vemb
Phone: +45 96 93 50 50
Fax: +45 96 93 50 51

Customer: MacArtney		Konstr.: MH	Sags nr: 10363-34494
Project title: MASH winch 2000-10-15kN		Check.:	Rev.: 11/10-2010 MDH
Drawing: Brake resistor		Last plot: 24-10-2011 08:58:18	
Drawing no:		Last change: 09-05-2011 12:53:56	Sheet: 19 of 23

Section	Item	Description	Type	Code nummer	Supplier
1	-A1	Termistorreleay	LT3SE00BD	3389110688085	Schneider Electric
1	-A2	Profibus encoder	PSM58-F2AAGR0BN-1416		Pepperl+fuchs
1	-A3	Profibus encoder	PSM58-F2AAGR0BN-1416		Pepperl+fuchs
1	-B1	Brake ensretter	ROBA SWITCH2/017.000.2		Frimodt Pedersen
1	-E1	PLC power supply	Q63P		Mitsubishi
1	-E2	PLC CPU	Q03UDE-CPU		Mitsubishi
1	-E3	Data logger module	QD81DL96		Mitsubishi
1	-E4	PLC profibus	QJ71PB92V		Mitsubishi
1	-E5	Digital input module	QX80		Mitsubishi
1	-E6	Digital output module	QY10		Mitsubishi
1	-E7	Analog input	Q64AD		Mitsubishi
1	-E8	Analoog output	Q64DAN		Mitsubishi
1	-E9	Seriel communication	QJ71C24N		Mitsubishi
1	-FV1	Frequence inverter	ATV71HD15N4	3389118064652	Schneider Electric
1	-FV1.1	Encoder feedback card	VW3A3401	3389118067202	Schneider Electric
1	-FV2	Frequence inverter	ATV71H075N4	3389118064522	Schneider Electric
1	-H2	Pilot light yellow 24V AC/DC	XB4BVB5	3389110891942	Schneider Electric
1	-H3	Pilot light yellow 24V AC/DC	XB4BVB5	3389110891942	Schneider Electric
1	-H6	Pilot light yellow 24V AC/DC	XB4BVB5	3389110891942	Schneider Electric
1	-K1	Contactor 9A 3P+1NO+1NC, Uc 24V DC	LC1D09BD	3389110353075	Schneider Electric
1	-K1	Auxiliary contact block 3NO+1NC	LADN31	3389110384178	Schneider Electric
1	-K2	Contactor 9A 3P+1NO+1NC, Uc 24V DC	LC1D09BD	3389110353075	Schneider Electric
1	-K4	Safety modul, cat.4, 3NO(s), 24VAC/DC	XPSAF5130	3389110080889	Schneider Electric
1	-K5	Interface relay	G2R-2SN (S) 24DC	4536854937224	Omron

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A. Schmidt's Marine-EL A/S
Idumvej 6, Bur
DK-7570 Vemb
Phone: +45 96 93 50 50
Fax: +45 96 93 50 51

Section	Item	Description	Type	Code nummer	Supplier
1	-K6	Interface relay	G2R-2SN (S) 24DC	4536854937224	Omron
1	-K7	Interface relay	G2R-2SN (S) 24DC	4536854937224	Omron
1	-K8	Interface relay	G2R-2SN (S) 24DC	4536854937224	Omron
1	-K9	Interface relay	G2R-2SN (S) 24DC	4536854937224	Omron
1	-K11	Interface relay	G2R-2SN (S) 24DC	4536854937224	Omron
1	-K12	Interface relay	G2R-2SN (S) 24DC	4536854937224	Omron
1	-L1	Limit switch	XCKM115H29	3389110973075	Schneider Electric
1	-L2	Limit switch	XCKM115H29	3389110973075	Schneider Electric
1	-Q1	Motor circuit breaker Ir 24-32A	GV2ME32	3389110343298	Schneider Electric
1	-Q2	Motor circuit breaker Ir 6,3-10A	GV2ME14	3389110343137	Schneider Electric
1	-R1	Joystick	S22M-01 ZP	V 1183	Gessmann
1	-R2	Joystick	S22M-01 ZP	V 1183	Gessmann
1	-R5	Resistor	100 ohm		Lund & Sørsensen
1	-R6	Resistor	100 ohm		Lund & Sørsensen
1	-R7	Resistor	100 ohm		Lund & Sørsensen
1	-R8	Resistor	100 ohm		Lund & Sørsensen
1	-S1	Emergency stop pushbutton Ø40 push-pull	XB4BS8444	3389110959000	Schneider Electric
1	-S2.H1	Illum. pushbutton green 24V AC/DC, 1NO+	XB4BW33B5	3389110892048	Schneider Electric
1	-S3	Selector switch 2 pos., short handle, 1	XB4BD21	3389110887075	Schneider Electric
1	-S4	Pushbutton flush white	ZB4BA1	3389110887457	Schneider Electric
1	-S4	Switch body with 1NO	ZB4BZ101	3389110889376	Schneider Electric
1	-S5	Emergency stop pushbutton Ø40 push-pull	XB4BS8444	3389110959000	Schneider Electric
1	-S7	Selector switch 2 pos., short handle, 1	XB4BD21	3389110887075	Schneider Electric
1	-S8	Selector switch 3 pos., short handle, 2	XB4BD53	3389110887112	Schneider Electric

ASME A/S
A. Schmidt's Marine-EL A/S
Idumvej 6, Bur
DK-7570 Vemb
Phone: +45 96 93 50 50
Fax: +45 96 93 50 51

Section	Item	Description	Type	Code nummer	Supplier
1	-S10.H8	Illum. pushbutton red 24V AC/DC, 1NO+1N	XB4BW34B5	3389110892055	Schneider Electric
1	-S11.H9	Illum. pushbutton blue 24V AC/DC, 1NO+1	XB4BW36B5	3389110119756	Schneider Electric
1	-S12.H10	Illum. pushbutton blue 24V AC/DC, 1NO+1	XB4BW36B5	3389110119756	Schneider Electric
1	-S13.H11	Illum. pushbutton red 24V AC/DC, 1NO+1N	XB4BW34B5	3389110892055	Schneider Electric
1	-U1	Power supply 24VDC	S8VT-F24024E	S8VT-F24024E	OMRON
1	-U2	DC power +12 0 -12	AS +12 0 -12	AS +12 0 -12	ASME
1	-A4	Load converter	PR2261	PR2261	PR Electronic
1	-A5	Operator panel	E1022	5703436219811	Mitsubishi
1		Switchboard	600X1000X300	63765	Elsteel
		Remote control box	300X150X120	71760	Elsteel
		Box brake resistor	200X200X80	72010	Elsteel
		Lift-O-Mat	Lift-O-Mat 083801	04083801	BRD. KLEE

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DK-7570 Vemb
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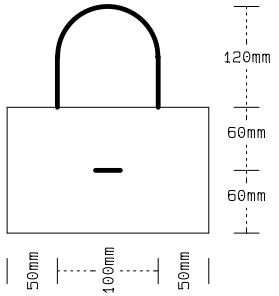
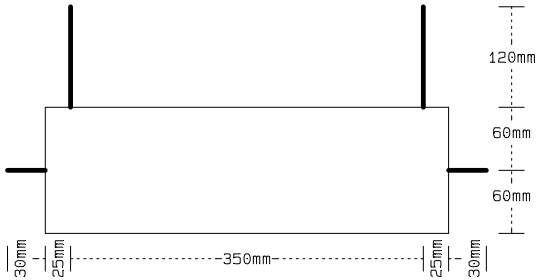
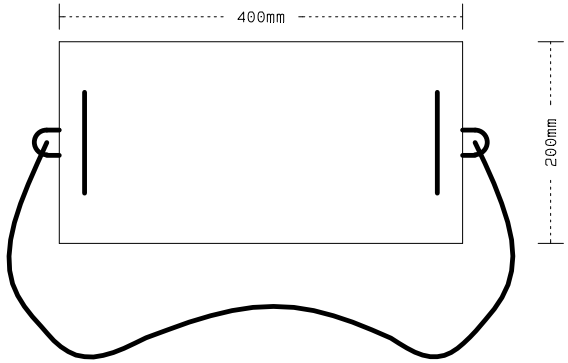
Box seen from the end

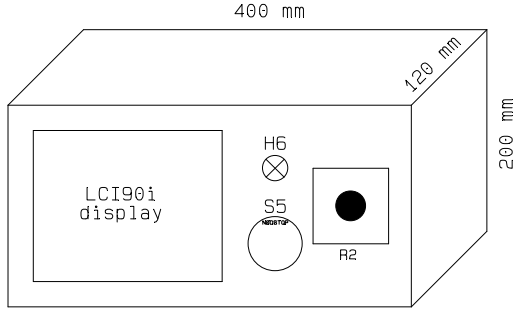


Box seen from the side



Box seen from top





Terminalrow X2 in this box

S5: EM.STOP
H6: REMOTE CONTROL
R2: JOYSTICK

ASME A/S
A. Schmidt's Marine-EL A/S
Idumvej 6, Bur
DK-7570 Vemb
Phone: +45 96 93 50 50
Fax: +45 96 93 50 51

Customer: MacArtney		Konstr.: MH	Sags nr: 10363-34494
Project title: MASH winch 2000-10-15kN		Check.:	Rev.:
Drawing:		Last plot: 24-10-2011 08:58:18	
Drawing no:		Last change: 09-05-2011 14:26:20	Sheet: 23 of 23

8 Section - Trouble Shooting

8.1 Alarm list

The following text aides to further explain the various alarms, and how to trouble shoot. The alarms are divided into two groups:

1. Critical, will prevent the winch to run.
2. Information, will inform the operator about the winch status. The winch will continue to run.

No.	Alarm description:	Status:
1.	Emergency stop: Look for activated emergency stops, and reset on switch S10 on the front of the main electrical cabinet. If Emergency stop reset button lights, the emergency stop relay is not reset. Ref. dwg: El.drawing sheet 5 of 23	Critical
2.	Level wind on limit switches: Can only happen if operator has moved level wind in manual, or in case of damaged level wind encoder.	Information
3.	Level wind in manual: Only to make the operator aware that this mode is not a normal working condition and that level wind should be set in auto when operating the winch.	Information
4.	Thermistor motor Check function of external motor fan. Let motor cool down and locate cause for overheating and rectify, prior to operating the winch.	Critical
5.	Fault on profibus: Check for damage on profibus cables. Open main switchboard and turn switch Q2 to off. Wait 30 seconds, and switch back on. Check if communication is restored. If not, start location the source by switching off the various frequency converters and other components.	Critical
6.	Fault on level wind encoder: Check for damage on profibus cables. Replace damaged encoder with spare.	Critical
7.	Fault on Winch encoder: Check for damage on profibus cables. Replace damaged encoder with spare.	Critical
8.	Winch over top layer: Software is capable of total 19 layers of umbilical. If 19 layers are exceeded this alarm is issued. This fault may indicate damaged encoder.	Critical, will pay out cable
9.	Fault analog input: This is a fault at the analog input module (E7). Replace with spare part	Information
10.	Fault analog output: This is a fault at the analog output module (E8). Replace with spare part	Information
11.	Fault MRU: Winch will stop AHC operation. Check the MRU.	Critical only AHC not working
12.	Wire broken load cell: Check the circuit for the load cell, the signal have to be between 4-20mA. Constant tension and auto rendering cannot be activated, AHC can still be activated.	Information
13.	Fault level wind position: The level wind is not where it expected to be. Check if there is a fault code at the frequency converter display for the level wind.	Information
14.	Auto rendering activated: The tension in the umbilical has exceeded the setting for the auto rendering and the winch has changed to tension mode.	Information

15.	<u>No compact flash card:</u> No usable compact flash card installed in the data logger module (E3)	Information
16.	<u>Fault data logging module:</u> Data logging has stopped. Open main switchboard and turn switch Q2 to off, wait 30 seconds, and switch back on. Check if the fault still is active, then try with another compact flash card or replace the module.	Information

8.2 Changing encoder for Level wind

1. Set Level Wind in manual and move level wind to the start end (where umbilical rotary junction box is located).
2. Switch off the winch power and dismount the “old” encoder, the encoders back end (with the cable) act as a plug on the main body, the back end is housing an address switch block, if changing this be sure to set the dip switches in same position as the “old” one.
3. Install the new encoder.
4. Switch on the power and start the winch (still with the level wind in manual).
5. Log on the E1022 operator panel with level 2 password. (Service password)
6. Read page 10 and 11 of the attached “Menu for E1022 panel”.
7. Do the Level wind setup.
8. Set level Wind in auto.

Warning: Do not by mistake Preset the Drum Encoder only level wind encoder.

8.3 Replacing a disc brake in Main Electric Motor

1. Cut off electric power to the winch.
2. Remove the electrical connection to the brake inside motor terminal housing.
3. Dismantle the external cooling fan.
4. Dismantle encoder cover (Bolted to the brake)
5. Loosen bolt in coupling for the motor/ encoder
6. Unscrew bolt for the encoder torque arm.
7. Carefully pull the encoder off the motor shaft
8. Dismantle the brake by unscrewing the 6 off Allen bolts, and remove the brake.
9. Check the brake lining plate for damages
10. Mount the brake lining disc and adjust according to procedure section.4.6.1

8.4 Changing encoder for Drum

1. Note the following data from ”True value from encoders”
    1. Drum
    2. Level wind
    3. Winch on Layer
    4. Turns on Drum
    5. Wire out
2. Switch off the winch power and dismount the “old” encoder.
3. Do not mount the new encoder mechanically only electrically.
4. Set level wind in manual and switch on power.
5. Turn the new encoder until its values are as before.
6. Now mount the encoder without turning it.

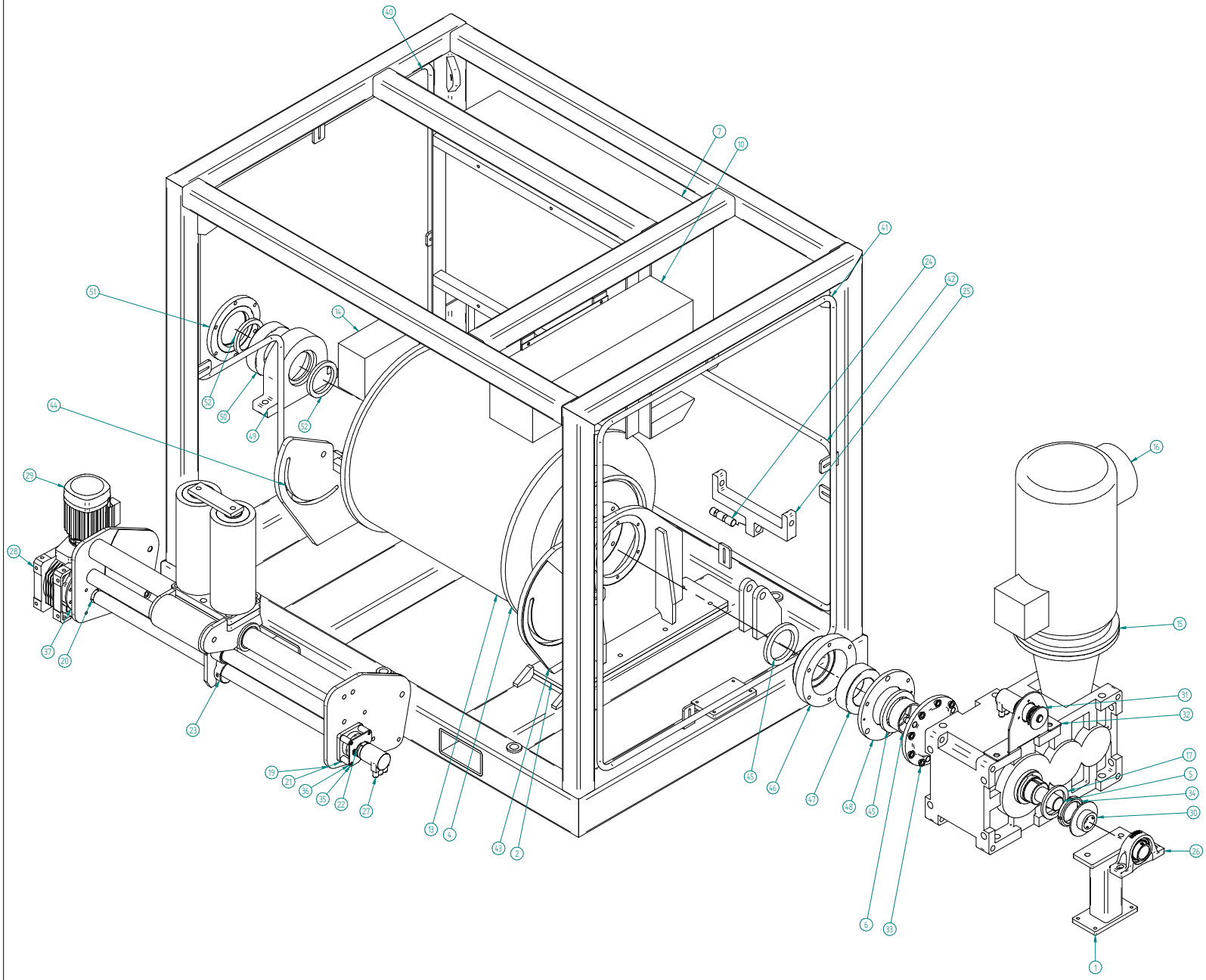
NOTE: If you were unable to retrieve data due to a defect encoder, turn the encoder until wire out is equal to the actual length out.
Switch “level wind” to automatic again and adjust until “level wind” position is matching the cable.
Then go to step 6.

9 Section - Recommended Spares

9.1 Recommended Spare Parts

Please Notice that actual spare parts may vary depending on contractual agreement, the following lists are to be taken as recommendations only

9.1.1 Mechanical spare parts



Item no	Subject	Material	Weight	Drawing no	Raw-material	Quantity
1	Frame	S 355	485 kg	35479-0-10		1
2	Side1	S 355	87 kg	35479-0-13		1
4	Drum	ST52-3	227 kg	35479-0-11		1
5	Main shaft					1
6	Washer	AISI304				1
7	El-Box	RF	144 kg			1
8*	Fork	AISI304	0 kg	34494-0-114		1
9*	Stopkontakt	AISI304	1 kg	34494-0-110		2
10	Brakeresistor		8 kg			1
11*	Stopswitch_Right		1 kg	33534-0-91		1
12*	Stopswitch_Left		1 kg	33534-0-90		1
13	Umbilical	ø10mm	532 kg			1
14	Junctionbox_1					1
15	RXV2808C1164_4PAMG1EC160B5M1		250 kg			1
16	160 M B5-Bremse		182 kg			1
17	Skive		0 kg	35479-0-109		1
19	Levelwind		200 kg	35479-0-15		1
20	FY 35					1
21	FY30FM					1
22	Threadspindle	S355	15 kg	35479-0-103		1
23	Nut	ST52-3	2 kg			1
24	Load pin					1
25	Gaffel for load pin	S355	6 kg	35479-0-105		1
26	SY 50					1
27	Encoder – PSM 581	AISI316	2 kg			1
28	w86u-p80b14		37 kg			1
29	K21r_80_G4-3D					1
30	Chain wheel 06B Z40	AISI304	1 kg	482105		1
31	Encoder – PSM 581	AISI304	2 kg	Enc. kompl.-482080		1
32	Plate for encoder					1
33	Nordlock					9
34	KM_6_PART1					1
35	Plade for encoder	AISI 304	0 kg	35479-0-108		1
36	Bøs for encoder	AISI 304	0 kg	35479-0-104		3
37	Momentarm					1
38*	Skive2					1
39*	Skive for gear	S355	0 kg	35479-0-110		1
40	Saftygrid	S355	12 kg	3		1
41	Saftygrid	S355	12 kg	35479-0-107		1
42	Saftygrid	S355	11 kg	2		1
43	Wearing plate					1
44	Wearing plate_3					1
45	CB100-150-13	Gummi	0 kg			2
46	Bearinghousing	ST52-3	11 kg	35479-0-102		1
47	Bearing23120		5 kg			1
48	Cover100-220	S 355	4 kg	35479-0-102		1
49	Bearing house	S355G3	16 kg	35479-0-16-100		1
50	Bearing23024	Steel	4 kg			1
51	Cover200-400	S355J2G3	4 kg	35479-0-16-100		1
52	SM120-150-12	Rubber	0 kg			2

–	–	–	–	Material:	Weight: 2453 kg
–	–	–	–	Messurements without tolerances acc. to DS/ISO 2768-1 m	File no: –
0	–	–	–		App.
Revision		Date	Name	Path: –	Date / Name

Unauthorize use of this drawing, wich may not be copied, is subjected to prosecution according to the law of illoyal competition

Costumer: WH01

Subject: Winch2000-8,18-10,6

MacArtney UNDERWATER TECHNOLOGY

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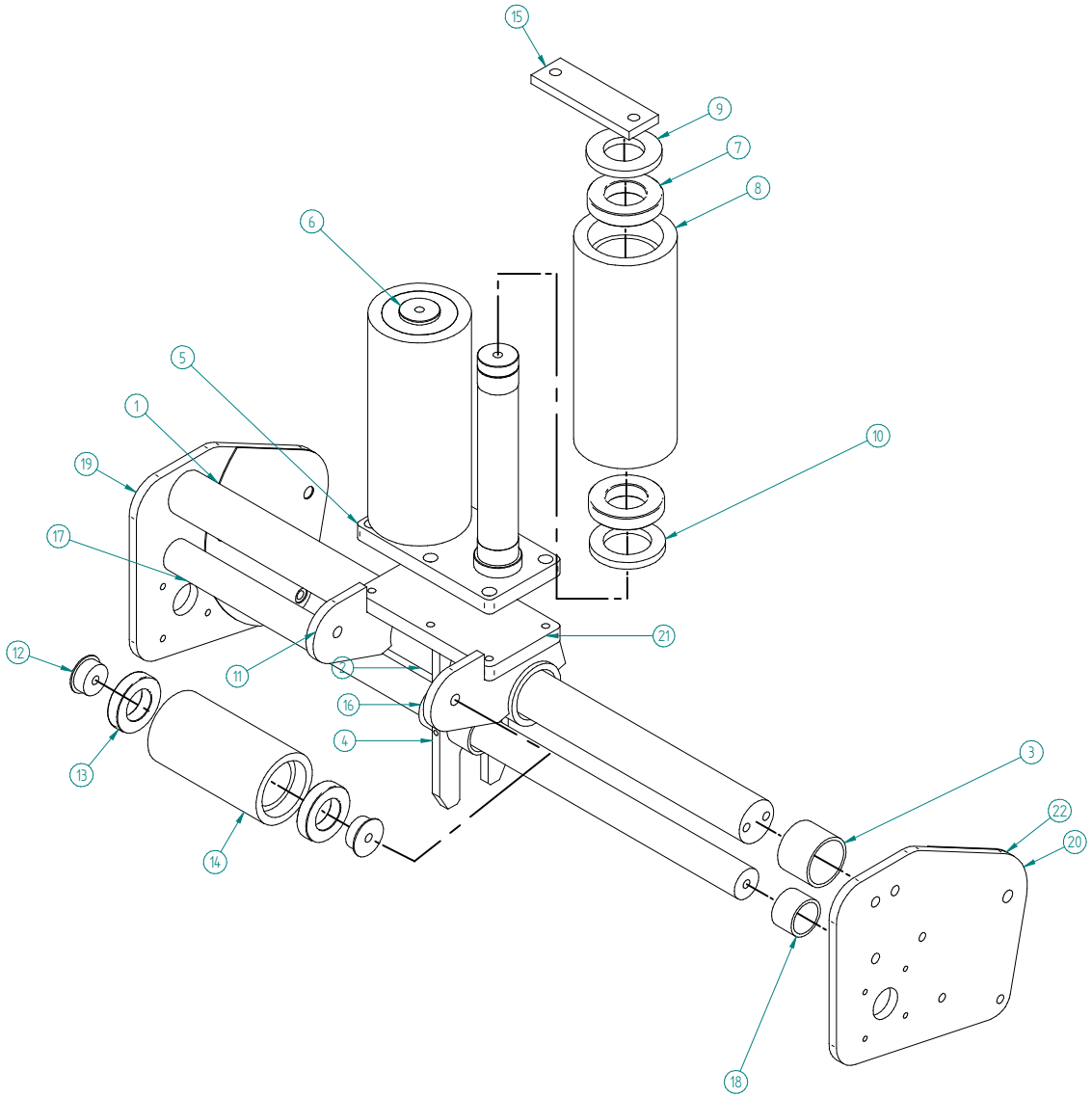
Scala: 1:10	Date: 06-10-11
Drawn by.: TS	Ordre no: 11151-35479
Format: A1	Drawing no: 35479-0-EXP



Item no	Subject	Material	Weight	Drawing no	Raw-material	Quantity
1	Shaft ø70	Centerless	35 kg			1
2	Leading pipe	ST52-3	7 kg			1
3	Bush70-80-60	Oliebronze	1 kg			2
4	Gaffel1	ST52-3	3 kg			1
5	Hole plate	ST52-3	6 kg			1
6	shaft ø60	ST52-3	17 kg			2
7	6212-2RS		5 kg			4
8	Roll ø117	ST52-3	58 kg			2
9	CB60-110-12	Gummi	0 kg			2
10	CB70-110-12	Gummi	0 kg			2
11	Fork2	ST52-3	4 kg			2
12	Bearing shaft	ST52-3	1 kg			2
13	6210-2RS1	RF	1 kg			2
14	Roll⌀108	ST52-3	10 kg			1
15	Top plate	ST52-3				1
16	Bush	ST52-3				1
17	Shaft ø50	ST52-3	18 kg			1
18	Bush50-60-40	Messing				2
19	Doubling1	S355J2G3	13 kg			1
20	Doubling1	S355J2G3	13 kg			1
21	Hole plate	ST52-3	8 kg			1
22	Wearing plate	AISI 304				2
23*	Axel for moment					1

-	-	-	-	Material:	Weight: 200 kg
-	-	-	-	Messurements without tolerances acc. to DS/ISO 2768-1 m	File no: -
0	-	-	-		App.
Revision		Date	Name	Path: -	Date / Name

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Costumer: WH01

Subject: Levelwind

MacArtney UNDERWATER TECHNOLOGY SH GROUP AS Hydraulic · Steel · Engineering

Scala: -	Date: 06-10-11
Drawn by.: TS	Ordre no: 11151-35479
Format: A3	Drawing no: 35479-0-15 EXP

9.1.2 Electrical Spare parts.

Section	Item	Description	Type	Code nummer	Supplier
1	-A1	Termistorreleay	LT3SE00BD	3389110688085	Schneider Electric
1	-A2	Profibus encoder	PSM58-F2AAGR0BN-1416		Pepperl+fuchs
1	-A3	Profibus encoder	PSM58-F2AAGR0BN-1416		Pepperl+fuchs
1	-B1	Brake ensretter	ROBA SWITCH2/017.000.2		Frimodt Pedersen
1	-E1	PLC power supply	Q63P		Mitsubishi
1	-E2	PLC CPU	Q03UDE-CPU		Mitsubishi
1	-E3	Data logger module	QD81DL96		Mitsubishi
1	-E4	PLC profibus	QJ71PB92V		Mitsubishi
1	-E5	Digital input module	QX80		Mitsubishi
1	-E6	Digital output module	QY10		Mitsubishi
1	-E7	Analog input	Q64AD		Mitsubishi
1	-E8	Analoog output	Q64DAN		Mitsubishi
1	-E9	Seriel communication	QJ71C24N		Mitsubishi
1	-FV1	Frequence inverter	ATV71HD15N4	3389118064652	Schneider Electric
1	-FV1.1	Encoder feedback card	VW3A3401	3389118067202	Schneider Electric
1	-FV2	Frequence inverter	ATV71H075N4	3389118064522	Schneider Electric
1	-H2	Pilot light yellow 24V AC/DC	XB4BVB5	3389110891942	Schneider Electric
1	-H3	Pilot light yellow 24V AC/DC	XB4BVB5	3389110891942	Schneider Electric
1	-H6	Pilot light yellow 24V AC/DC	XB4BVB5	3389110891942	Schneider Electric
1	-K1	Contactor 9A 3P+1NO+1NC, Uc 24V DC	LC1D09BD	3389110353075	Schneider Electric
1	-K1	Auxiliary contact block 3NO+1NC	LADN31	3389110384178	Schneider Electric
1	-K2	Contactor 9A 3P+1NO+1NC, Uc 24V DC	LC1D09BD	3389110353075	Schneider Electric
1	-K4	Safety modul, cat.4, 3NO(s), 24VAC/DC	XPSAF5130	3389110080889	Schneider Electric
1	-K5	Interface relay	G2R-2SN (S) 24DC	4536854937224	Omron

ASME A/S
A. Schmidt's Marine-EL A/S
Idumvej 6, Bur
DK-7570 Vemb
Phone: +45 96 93 50 50
Fax: +45 96 93 50 51

Section	Item	Description	Type	Code nummer	Supplier
1	-K6	Interface relay	G2R-2SN (S) 24DC	4536854937224	Omron
1	-K7	Interface relay	G2R-2SN (S) 24DC	4536854937224	Omron
1	-K8	Interface relay	G2R-2SN (S) 24DC	4536854937224	Omron
1	-K9	Interface relay	G2R-2SN (S) 24DC	4536854937224	Omron
1	-K11	Interface relay	G2R-2SN (S) 24DC	4536854937224	Omron
1	-K12	Interface relay	G2R-2SN (S) 24DC	4536854937224	Omron
1	-L1	Limit switch	XCKM115H29	3389110973075	Schneider Electric
1	-L2	Limit switch	XCKM115H29	3389110973075	Schneider Electric
1	-Q1	Motor circuit breaker Ir 24-32A	GV2ME32	3389110343298	Schneider Electric
1	-Q2	Motor circuit breaker Ir 6,3-10A	GV2ME14	3389110343137	Schneider Electric
1	-R1	Joystick	S22M-01 ZP	V 1183	Gessmann
1	-R2	Joystick	S22M-01 ZP	V 1183	Gessmann
1	-R5	Resistor	100 ohm		Lund & Sørsensen
1	-R6	Resistor	100 ohm		Lund & Sørsensen
1	-R7	Resistor	100 ohm		Lund & Sørsensen
1	-R8	Resistor	100 ohm		Lund & Sørsensen
1	-S1	Emergency stop pushbutton Ø40 push-pull	XB4BS8444	3389110959000	Schneider Electric
1	-S2.H1	Illum. pushbutton green 24V AC/DC, 1NO+	XB4BW33B5	3389110892048	Schneider Electric
1	-S3	Selector switch 2 pos., short handle, 1	XB4BD21	3389110887075	Schneider Electric
1	-S4	Pushbutton flush white	ZB4BA1	3389110887457	Schneider Electric
1	-S4	Switch body with 1NO	ZB4BZ101	3389110889376	Schneider Electric
1	-S5	Emergency stop pushbutton Ø40 push-pull	XB4BS8444	3389110959000	Schneider Electric
1	-S7	Selector switch 2 pos., short handle, 1	XB4BD21	3389110887075	Schneider Electric
1	-S8	Selector switch 3 pos., short handle, 2	XB4BD53	3389110887112	Schneider Electric

ASME A/S
A. Schmidt's Marine-EL A/S
Idumvej 6, Bur
DK-7570 Vemb
Phone: +45 96 93 50 50
Fax: +45 96 93 50 51

Section	Item	Description	Type	Code nummer	Supplier
1	-S10.H8	Illum. pushbutton red 24V AC/DC, 1NO+1N	XB4BW34B5	3389110892055	Schneider Electric
1	-S11.H9	Illum. pushbutton blue 24V AC/DC, 1NO+1	XB4BW36B5	3389110119756	Schneider Electric
1	-S12.H10	Illum. pushbutton blue 24V AC/DC, 1NO+1	XB4BW36B5	3389110119756	Schneider Electric
1	-S13.H11	Illum. pushbutton red 24V AC/DC, 1NO+1N	XB4BW34B5	3389110892055	Schneider Electric
1	-U1	Power supply 24VDC	S8VT-F24024E	S8VT-F24024E	OMRON
1	-U2	DC power +12 0 -12	AS +12 0 -12	AS +12 0 -12	ASME
1	-A4	Load converter	PR2261	PR2261	PR Electronic
1	-A5	Operator panel	E1022	5703436219811	Mitsubishi
1		Switchboard	600X1000X300	63765	Elsteel
		Remote control box	300X150X120	71760	Elsteel
		Box brake resistor	200X200X80	72010	Elsteel
		Lift-O-Mat	Lift-O-Mat 083801	04083801	BRD. KLEE

ASME A/S
A. Schmidt's Marine-EL A/S
Idumvej 6, Bur
DK-7570 Vemb
Phone: +45 96 93 50 50
Fax: +45 96 93 50 51

9.2 Request For Quote

Please forward quote for the following items, where no quantity “Qty” is noted please consider as zero (0).

Customer Information:

Forward Quote to:
Company / Institution: _____
Postal Adress: _____
_____
_____
_____

Attention: _____
Tel: _____
Fax: _____
E-mail: _____

When desired number of parts has been entered in tables below, please forward document to:

MacArtney A/S
Gl. Guldagervej 48
DK-6710 Esbjerg V
Attn: Launch & Recovery

Or by:

E-mail: mac-dk@macartney.com
Fax: +45 7511 7220

10 Section - Service and Support

10.1 Contact Details

No service contract has been negotiated and agreed upon.

If such a contract is desired please contact MacArtney A/S 24 hour basis 365 days a year at:

MacArtney A/S
Gl. Guldagervej 48
DK-6710 Esbjerg V
Attn: Project Manager, Launch & Recovery

Tel.: +45 7613 2000
Fax: +45 7511 7220
E-mail: mac-dk@macartney.com

For further information, please visit the MacArtney Group Website:
www.macartney.com

10.2 Contact Details

Winch Support - General
MacArtney A/S
Gl. Guldagervej 48
DK-6710 Esbjerg V
Attn: Project Manager, Launch & Recovery

Tel.: +45 7613 2000
Fax: +45 7511 7220
E-mail: mac-dk@macartney.com

Winch Support - Electrical:
A. Schmidts Marine el
Idomvej 6
DK-7570 Vemb

Tel.: +45 9693 5050
Fax: +45 9693 5051
Web: www.asme.dk

Søren Bach Hartvigsen
sbh@marineel.dk
+45 21750043

Arne Schmidt
as@marineel.dk
+45 20417036

Norway:
MacArtney Norge AS
Strandsvingen 3
N-4032 Stavanger

Tel.: +47 5195 1800
Fax: +47 5195 1810
E-mail: mac-no@macartney.com

USA
MacArtney Inc.
3660 Westchase Drive
Houston, TX 77042

Tel.: +1 713 266 7575
Fax: +1 713 266 7519
E-mail: offshore@macartney.com

The Netherlands
MacArtney Benelux BV
Mandenmakerstraat 188
3194 DG Hoogvliet

Tel.: +31 10 2041166
Fax: +31 10 2480806
E-mail: mac-nl@macartney.com

France
EurOceanique S.A.
Avenue Olivier PERROY
Les Portes de Rousset - Bât. E
F-13790 ROUSSET

Tel.: +33 (0) 442 394 985
Fax: +33 (0) 442 397 336
E-mail: mac-fr@macartney.com

The United Kingdom
MacArtney UK Ltd.
Howemoss Drive
Kirkhill Industrial Estate
Dyce
Aberdeen
AB21 0GL

Tel.: +44 (0) 1224 358 500
Fax: +44 (0) 1224 358 510
E-mail: mac-uk@macartney.com

Germany
MBT GmbH
Meerestechnisches Büro Turla
Wischhofstrasse 1-3
Geb. 11
D-24148 Kiel

Tel.: +49 431 7207 200
Fax: +49 431 7207 207
E-mail: mac-de@macartney.com

For further information, please visit the MacArtney Group Website:
www.macartney.com

11 Section - DNV Certificates

DET NORSKE VERITAS,
DANMARK A/S
ENERGY DENMARK

Dokken 10
DK-6700 Esbjerg, Denmark

Tel: +45 79128600
Fax: +45 79128601
http://www.dnv.com
CVR No. 89832314

MacArtney A/S
Gl. Guldagervej 48
DK-6710 Esbjerg V

Att. Jesper Bitsch Kristensen

11 NOV. 2011

Your ref.:	Our ref.:	Date:
	FWBDK-201129917	2011-11-09
File no.:	Init:	
PP011218	JEG/VIRO/hbu	
PP011221		

STATEMENT OF CONFORMITY

Enclosed please find Statement of Conformity for frames

FWBDK-201103327	Serial Number: H11151-V35479-1
FWBDK-201103328	Serial Number: H11151-V35479-2
FWBDK-201105173	Serial Number: H11152-V35480-1
FWBDK-201105179	Serial Number: H11152-V34480-2

Yours faithfully
for DET NORSKE VERITAS AS

Mick Cramer Jakobsen
Head of Section, FWBDK777

Jan Erik Gaardhøje
Senior surveyor

Encl.

- FWBDK-201103327 (SoC)
- FWBDK-201103328 (SoC)
- FWBDK-201105173 (SoC)
- FWBDK-201105179 (SoC)

SoC. No. : FWBDK-201103327
Ord. No. : PP011218

DNV

DET NORSKE VERITAS

STATEMENT OF CONFORMITY FOR FRAMES:

Item	:	Winch Frame
Manufacturer	:	SH-Group A/S, Denmark
Serial Number	:	H11151-V35479-1
Ordered by	:	MacArtney A/S
Intended for	:	WHOI

This is to certify that DNV during production attended the premises of SH-Group A/S with the purpose of carrying out surveys, and finally on the 27th of June 2011 witnessed the "lifting test" of the above mentioned frame. This SoC is based on Design Verification Letter FWBDK-201103317.

BASIS FOR APPROVAL

The frame is checked with respect to strength and material qualities according to
- ILO no.152, code of practice "Safety and health in dock work".

Safe Working Load – Winch frame: 3000 kg

Design temperature Td : -20° C.
Max. sling angle from vert.: 45°

The frame is built in accordance with the following drawing:

Title	Drg No.	Rev
Frame	35479-0-10	0

Welding & Non destructive testing (NDT):

Welding was carried out by certified welders in accordance with approved welding procedures. 100% MPI was performed round padeyes and surrounding structure after load testing.

Tests: According to ILO 152, and principles of DNV Certification Note No.2.7-1, April 2006

Tests Load - Winch frame: 3750 kg (4-point lifting)

It is agreed that save as provided below Det Norske Veritas, its subsidiaries, bodies, directors, employees and agents shall have no liability for any loss, damage or expense allegedly caused or induced by their mistake or negligence, breach or warranty, or any other act, omission or error by them, including gross negligence or wilful misconduct by any such person with the exception of gross negligence or wilful misconduct by the governing bodies or senior executive officers of Det Norske Veritas. This applies regardless of whether the loss, damage or expense has affected anyone with whom Det Norske Veritas has a contract or a third party who has acted or relied on decisions made of information given by or on behalf of Det Norske Veritas. However, if any person uses the services of Det Norske Veritas or its subsidiaries or relies on any decision made or information given by or on behalf of them and in consequence suffers a loss, damage or expense provided to be due to their negligence, omission or default, then Det Norske Veritas will pay by way of compensation to such person a sum representing his proved loss. In the event Det Norske Veritas or its subsidiaries may be held liable in accordance with the sections above, the amount of compensation shall under no circumstances exceed the amount of the fee, if any, charged for that particular service, decision, advice or information. Under no circumstances whatsoever shall the individual or individuals who have personally caused the loss, damage or expense be held liable. In the event that any provision in this section shall be invalid under the law of any jurisdiction, the validity of the remaining provisions shall not in any way be effected.

Remarks:

This statement of conformity only covers transport (lifting) inside harbours; offshore lifting/handling is not covered.

- Lifting sling is not covered by this Statement of Conformity
- Installation aspects and designated foot brackets are not covered by this Statement of Conformity.

Note:

The frame is stamped: **FWBDK-201103327**

Signed for **Det Norske Veritas A/S**

Name : Jan Erik Gaardhøje

Date : 2011-11-01
Place : Esbjerg, Denmark

SoC. No. : FWBDK-201103328
Ord. No. : PP011218

DNV

DET NORSKE VERITAS

STATEMENT OF CONFORMITY FOR FRAMES:

Item	:	Winch Frame
Manufacturer	:	SH-Group A/S, Denmark
Serial Number	:	H11151-V35479-2
Ordered by	:	MacArtney A/S
Intended for	:	WHOI

This is to certify that DNV during production attended the premises of SH-Group A/S with the purpose of carrying out surveys, and finally on the 27th of June 2011 witnessed the "lifting test" of the above mentioned frame. This SoC is based on Design Verification Letter FWBDK-201103317.

BASIS FOR APPROVAL

The frame is checked with respect to strength and material qualities according to
- ILO no.152, code of practice "Safety and health in dock work".

Safe Working Load – Winch frame: 3000 kg

Design temperature Td : -20° C.
Max. sling angle from vert.: 45°

The frame is built in accordance with the following drawing:

Title	Drg No.	Rev
Frame	35479-0-10	0

Welding & Non destructive testing (NDT):

Welding was carried out by certified welders in accordance with approved welding procedures. 100% MPI was performed round padeyes and surrounding structure after load testing.

Tests: According to ILO 152, and principles of DNV Certification Note No.2.7-1, April 2006

Tests Load - Winch frame: 3750 kg (4-point lifting)

It is agreed that save as provided below Det Norske Veritas, its subsidiaries, bodies, directors, employees and agents shall have no liability for any loss, damage or expense allegedly caused or induced by their mistake or negligence, breach or warranty, or any other act, omission or error by them, including gross negligence or wilful misconduct by any such person with the exception of gross negligence or wilful misconduct by the governing bodies or senior executive officers of Det Norske Veritas. This applies regardless of whether the loss, damage or expense has affected anyone with whom Det Norske Veritas has a contract or a third party who has acted or relied on decisions made of information given by or on behalf of Det Norske Veritas. However, if any person uses the services of Det Norske Veritas or its subsidiaries or relies on any decision made or information given by or on behalf of them and in consequence suffers a loss, damage or expense provided to be due to their negligence, omission or default, then Det Norske Veritas will pay by way of compensation to such person a sum representing his proved loss. In the event Det Norske Veritas or its subsidiaries may be held liable in accordance with the sections above, the amount of compensation shall under no circumstances exceed the amount of the fee, if any, charged for that particular service, decision, advice or information. Under no circumstances whatsoever shall the individual or individuals who have personally caused the loss, damage or expense be held liable. In the event that any provision in this section shall be invalid under the law of any jurisdiction, the validity of the remaining provisions shall not in any way be effected.

Remarks:

This statement of conformity only covers transport (lifting) inside harbours; offshore lifting/handling is not covered.

- Lifting sling is not covered by this Statement of Conformity
- Installation aspects and designated foot brackets are not covered by this Statement of Conformity.

Note:

The frame is stamped: **FWBDK-201103328**

Signed for **Det Norske Veritas A/S**

Name :

Jan Erik Gaardhøje

Date : 2011-11-02
Place : Esbjerg, Denmark